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August 1989

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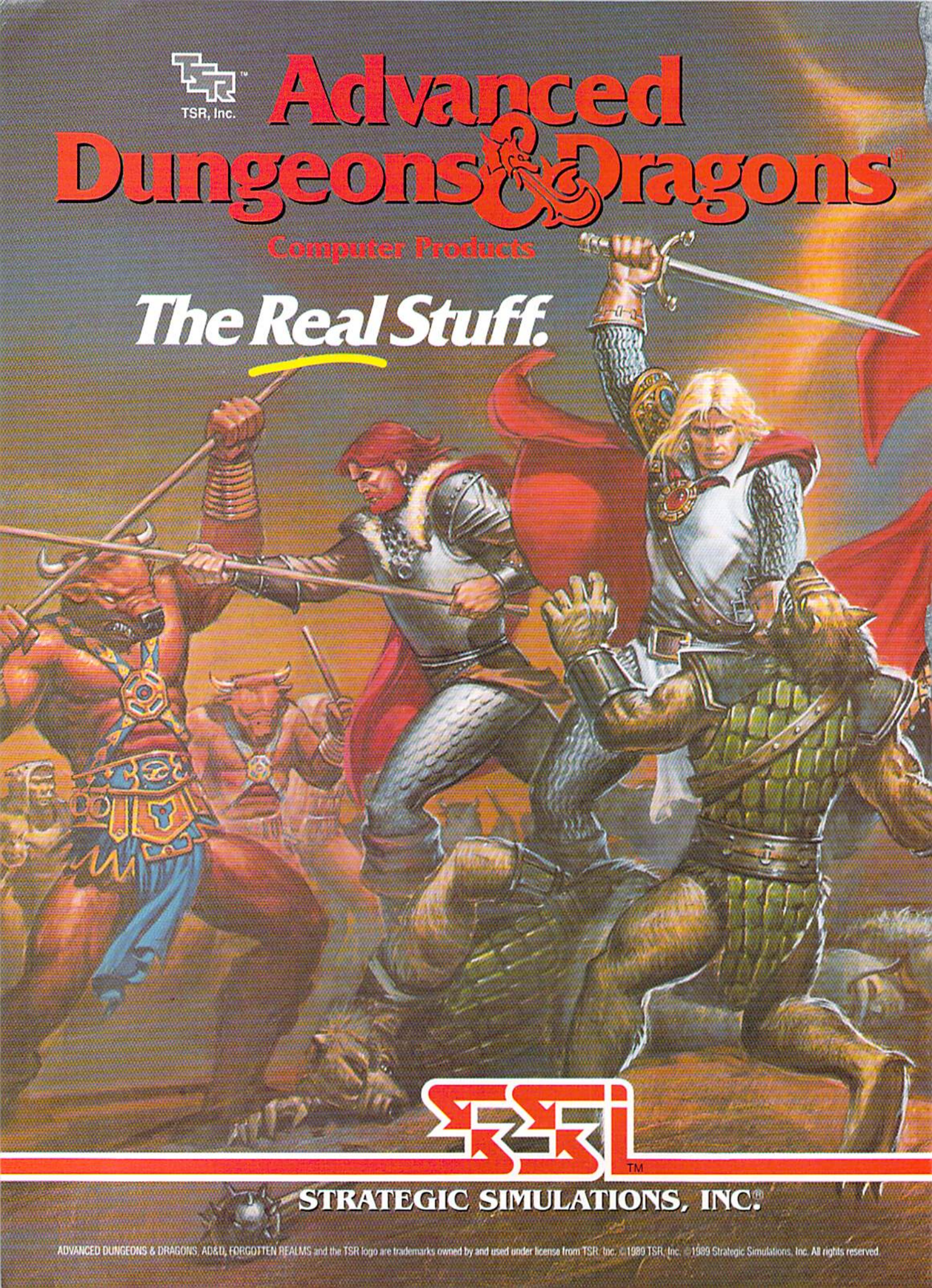

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EDITOR'S notes

We're pleased to announce the appointment of Patrick Parrish to associate editor of *COMPUTE!'s Gazette*. Pat has been with COMPUTE! Publications for more than six years and has served well in a variety of roles. He was most recently technical editor for the magazine.

For the past year, Pat has managed our most popular column, "Feedback," and he has done a considerable amount of editing on both programming articles and columns. He is the coauthor of *Machine Language Routines for the Commodore 64 and 128*, published by COMPUTE! Books. Pat will be heavily involved in the all of the day-to-day activities of the magazine. We're confident that he will continue to support and enhance *Gazette*'s tradition of excellence.

***

At this writing (late May), I've just returned from the spring meeting of the Software Publisher's Association (SPA), held in San Diego. One of the discussion sessions centered on the impact of Nintendo on the entire consumer software industry. A lot of good disk-based publishers fared badly in 1988, especially in the all-important fourth quarter (the Christmas season). Further inroads by Nintendo could cripple some of the larger houses.

Over the past few months, we've written about the Nintendo/64 debate, but the scope of the issue is much larger. All microcomputer platforms—including MS-DOS, Apple, and Amiga—have been negatively impacted by the videogame giant. Great concern was expressed at this SPA session, but, for a host of different reasons, no unified strategy among the disk-based software community emerged.

We continue our Nintendo/64 discussion with readers this month in "D'Iversions." We are also planning more coverage in next month's issue.

***

I was encouraged when I spoke with many of the software publishing leaders about upcoming support for the 64. Apparently, a fair number of new and promising software titles will be announced at the Summer Consumer Electronics Show, which will be held June 3–6 in Chicago. We'll be there and will have the specifics in our next issue.

Also next month, we'll name the winners of our contest, the Great Arcade Machine Challenge, announced in the February issue. We had an excellent response to the contest, and, as a result, a lot of good-looking games came in. Although we can print the names of the winners, we can't, unfortunately, print the listings in the magazine because of space limitations. However, we will include all of the winning programs on next month's disk.

Lance Elko
Associate Publisher/Editorial

COMPUTE!'s GAZETTE FOR COMMODORE 64/128 USERS

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LETTERS to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

Happy Down Under

Several of our members recently bought the 64K video upgrade module for the Commodore 128 from Software Support International in the U.S. One of the reasons we purchased from a U.S. company was because of the apparent lack of chips in Australia, but the main reason was that this module is a plug-in board with no soldering needed. Our modules arrived in three weeks and work perfectly.

We'd like to recommend this module to all 128 owners, in Australia or anywhere in the world, as a superb way of upgrading to 64K of video RAM. We also commend Software Support International for its excellent service. It really lived up to its name.

Philip Bishop
Ipswich Commodore Users Group
Qld., Australia

Online Option

In your January 1989 issue, you surveyed major online services. I've found a new one. It's called Mnematics, and it's very affordable. The staff's attitude toward users is like a breath of fresh air compared to the cynical disdain I've seen from some of the other services. Mnematics' rates vary, depending on the way one connects to the service. Mnematics may be reached at (800) 322-3633 (in New York, 914-365-0184).

Bruce R. Gilson
Silver Spring, MD

Thanks for the tip. We called Mnematics (based in Sparkill, New York) at the number you noted and talked with a representative who was very helpful. He told us that Mnematics doesn't spend money to advertise or promote itself. Mnematics has been around since 1983 and has grown simply by good word-of-mouth references. The service supports all popular machine formats (including the 64/128). According to the representative, Mnematics is also successfully established and thriving in the U.K.

Missing Programmer Found

Talk about immediate response! The day after receiving your June issue, containing my letter ("Programmers in the Bermuda Triangle?"), I received a note from Amateur Radio Station AK0N telling me of the whereabouts of Mike Apsey, author of "64 Morse R/T." The following day I received a disk with an update of "Lynx" from author Will Corley. (Be assured, Lynx users, he is alive and well at his old stand in Sacramento, and smarting from my letter implying otherwise.) The week's not over—I may yet hear from Dennis Colombo ("Electronic Cottage"). Thanks to you, AK0N, and Will Corley.

Pete Baker
Librarian
Marysville-Yuba City HACC
Browns Valley, CA

Teed Off

I don't know who Mickey McLean and Tom Netsel are, but it is clear that neither have ever been on a golf course. How they could pick *Jack Nicklaus' Greatest 18 Holes of Major Championship Golf* over *World Class Leaderboard* in your June issue, I'll never know.

Jack Lohman
Bartow, FL

Mickey and Tom (pictured on the June cover), authors of June's "Best Arcade Sports Games," are on the Gazette *editorial staff, and they do play golf. They noted that the choices in several of the sports categories, including golf, were difficult.*

Old News Is Good News

I've been having problems recently with my 64. It was getting hot and locking up almost every time I used it. Then it wouldn't turn on at all. As I was looking through some back issues of *Gazette* to get a price on a new 64, I came across a couple of tips that definitely bear repeating. I checked the fuse inside my computer, just as your magazine suggested, and that was the problem. I put in a new fuse and followed another tip you offered by removing the silver shield. Now my computer works well and stays cool. Thanks—you saved me a bundle.

Michael G. Tardy
University, MI

Loyalist Sounds Off

I have a 128, 1571 drive, Okidata 120 printer, and a black-and-white TV. I use this system seven days a week for at least an hour a day. It does everything. We do our church bulletin with it and our fliers with *geoPublish*. We have our budget on *geoCalc*, and we keep our mailing list in *geoFile* and *SuperBase 64*. The 64 mode of my 128 is serving me very well. I've had my computer for two years, and I'm more excited about it today than I was the first day I bought it. I don't think anyone, including Commodore, knows what a versatile and powerful machine the 64/128 really is.

Michael Mitchell
Flushing, NY

Write Now Written Off?

I'm trying to find the cartridge version of *Write Now*, Cardco's word processor for the 64.

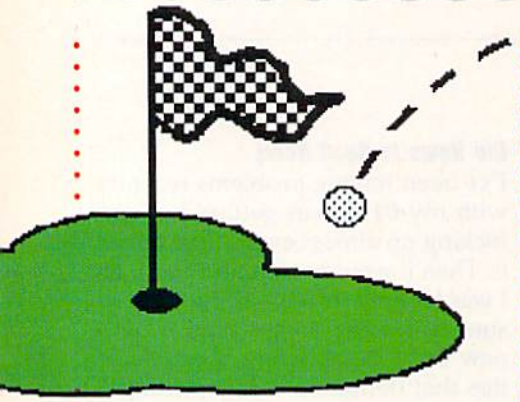
Dennis Linde
Hermitage, TN

Cardco went out of business several years ago, and we're not aware of any distributor handling their products. If any readers know of one, please write and let us know. **G**

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Edited by Mickey McLean



Play 54 More Holes with Jack

After you've mastered the three courses on *Jack Nicklaus' Greatest 18 Holes of Major Championship Golf,* from Accolade (550 South Winchester Boulevard, Suite 200, San Jose California 95128), you can tee it up on three more tough layouts with *Jack Nicklaus Presents the Major Championship Courses of 1989* ($19.95). This accessory disk, which must be used with the original game, features the host courses for this year's U.S. Open, British Open, and PGA Championship. You can now watch the best golfers in the world on television and then turn on your 64 and try to best their scores on the same courses, without the pressure of playing in a major championship.

One of the three new courses is the Oak Hill Country Club in Rochester, New York, host of this past June's U.S. Open. In 1980, when Oak Hill hosted the PGA Championship, Nicklaus won the tournament by seven strokes, the largest victory margin in the championship's history.

The British Open will be played July 20–23 on Scotland's Royal Troon Club course, which is included on the new disk. This classic golf course, established in 1888, features the longest (577 yards) and shortest (123 yards) holes of the courses used for championship play in the U.K. Accolade has included familiar Scottish terrain, including stone walls, heather and gorse, and a windswept sea. During the 1973 British Open, Nicklaus set the course record, shooting a 65.

The final major tournament of the 1989 golf tour, the PGA Championship, is slated for August 10–13 at the Kemper Lakes Golf Club in Hawthorn Woods, Illinois. This course, known for its abundance of water and sand, has lakes occupying 125 acres of the 270-acre course and 57 bunkers to contend with on the 18 holes. Accolade has not left out one drop of water or one grain of sand on its disk version.

For Home Workers

Dial Direct Response Marketing (44 Monterey Boulevard, San Francisco, California 94131) has introduced the Home Office Business Network (HOBN), an online computer network designed to serve the information and communication needs of home-based business owners. HOBN can be accessed via Minitel Services Company.

In addition to having electronic mail and online conferences between users, you can call up the HOBN Advisory Board's recommendations and techniques that small businesses can use to enhance profits and reduce costs. Subjects such as marketing, tax reduction, sales, and finance are presented each month. The online service also runs ads for products and services geared toward the home-business market.

Local dial-up of HOBN is available from 150 cities in North America. There is no subscription fee or minimum charge. The service costs $10.20 per hour and can be billed to a credit card. Free terminal-emulation and communications software is available from Dial Direct Response Marketing.

Action and Adventure Come to AD & D

Strategic Simulations (1046 North Rengstorff Avenue, Mountain View, California 94043) has released *Hillsfarr* ($39.95), the first Advanced Dungeons & Dragons action-adventure game and the second AD & D computer game set in TSR's Forgotten Realms game world.

You can create characters at the beginning of play or transfer one into the game from *Pool of Radiance* or its upcoming sequel, *Curse of the Azure Bonds.* The game can be played with only one character at a time, but any number of characters can be transferred into *Hillsfar* and sent on adventures in and around the city.

Hillsfar incorporates the characteristics of both adventure- and action-style games. At the beginning of the game, each character is sent on a series of quests, and each subsequent quest is automatically modified according to the character's class. During gameplay, each character must successfully complete action-oriented events including archery, maze exploration, arena combat, lock picking, and equestrian contests. If the player is successful, rewards such as gold, experience, and magical items are offered. Some of the character's rewards can be transferred to *Curse of the Azure Bonds.*

Should you run into too many obstacles along your way, SSI is offering a clue book ($7.95) to help you progress through the Forgotten Realms. *Hillsfar* is distributed by Electronic Arts.

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Everything but the Bugs in Your Teeth

Choose the hottest cycle on the streets and take it on a spin on a tough race course or accelerate to a record speed down a quarter-mile drag strip. If you yearn for the excitement of cycle racing, check out *Pocket Rockets* ($29.95), from Capcom U.S.A. (1283-C Mountain View/Alviso Road, Sunnyvale, California 94089). This fast-action game allows you to test-ride a variety of high-performance 600cc motorcycles.

You can choose from a Suzuki Katana, a Kawasaki Ninja, a Honda Hurricane, and a Yamaha FZR. The game features authentic instrument panels on-screen for each cycle. True-to-life sights and sounds have also been incorporated into the game.

Test each bike on a weaving road course or try out each cycle's straight-line acceleration in a quarter-mile drag race.

While you're testing your new Kawasaki, you can save money with Capcom's mail-in refund offer. Consumers can receive up to $10.00 back on recent Capcom purchases. A $2.50 refund is available for the purchase of two games. If you purchase four games, you can receive a $5.00 refund. Buy six games and get $10.00 back. To receive the rebate, you must send the mail-in certificate with UPC codes from game boxes with their cash register receipts to Capcom before December 31, 1990. Mail-in certificates will be packaged in all Capcom games released in 1989.

3-D Space

Enter the 3-D world of space with *Dark Side* ($29.95), from Spotlight Software (Cinemaware, 4165 Thousand Oaks Boulevard, Westlake Village, California 91362).

You become a mercenary of the future trying to save the world from destruction. Lasers, shields, and a jet power pack are at your disposal as you infiltrate a heavily guarded military zone and destroy a doomsday weapon. You must rely on strategy and puzzle solving to succeed. During your journey in space you'll discover hidden geographical secrets, learn to use a teleportation device, and solve the mysteries of the telepod crystals hidden throughout the military grounds.

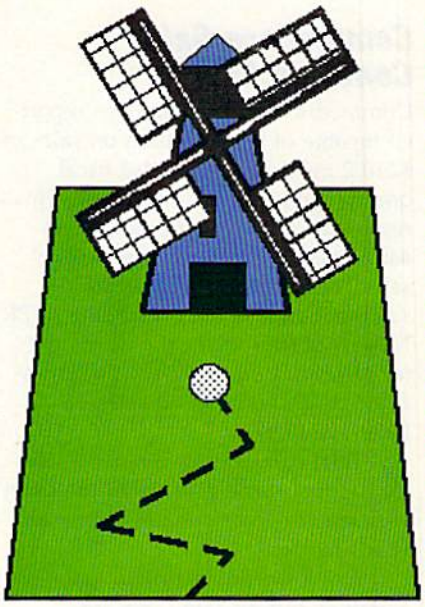
What I Like About You

Here's your chance to tell game designers what you like or don't like about their programs—and have input concerning future game scenarios. Sir-Tech Software (P.O. Box 245, Charlestown Mall, Ogdensburg, New York 13669) is sponsoring a "Wizardry—What's Hot, What's Not" essay contest, which provides a forum for user's opinions.

As a contestant, you must write an essay no longer than 2000 words that describes your likes and/or dislikes of the Wizardry series or a particular scenario from the series. The essay must also include a section describing what you'd like to see in a future Wizardry scenario. The deadline for entries is September 30, 1989.

All entries will be judged on creativity, writing style, and content, and winners will be selected from different age groups. Prizes include free software and Wizardry jackets, T-shirts, and caps. All entrants receive a Wizardry certificate. Entries will not be returned.

The Wizardry series began with *Wizardry I—Proving Grounds of the Mad Overlord*, which was followed by *Wizardry II—Knight of Diamonds* and *Wizardry III—Legacy of Llylgamyn*, all available for the 64. *Wizardry IV—The Return of Werdna* and *Wizardry V—Heart of Maelstrom* will soon be available for the 64.



Putt a Round

From the traditional to the bizarre, you can find putting challenges with *Hole-in-One Miniature Golf* ($29.95), from DigiTek Software (8910 North Dale Mabry Executive Center, Suite #37, Tampa, Florida 33614).

The game has classic courses that feature holes such as the obligatory windmill hole and theme courses that have holes that are somewhat unusual, including one that resembles a pinball machine. You alone or you and three of your friends can compete using a joystick.

Bunten to MicroProse

MicroProse Software (180 Lakefront Drive, Hunt Valley, Maryland 21030) has announced a five-year agreement with game designer Dan Bunten and his company, Ozark Softscape. The agreement gives MicroProse exclusive rights to all games produced by Ozark during the five-year period.

Bunten is known for the popular adventure games he created at Ozark such as *Seven Cities of Gold*, *Heart of Africa*, *M.U.L.E.*, and *Modem Wars*, which were published by Electronic Arts. MicroProse has yet to announce any new titles resulting from the agreement. ▷

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Commodore Sales Continue Climb

Commodore International has reported income of $12.4 million on sales of $210.2 million for the third fiscal quarter, which ended March 31. This represents a 38-percent increase in earnings and a 5-percent growth in sales compared to figures from the same period last year, according to PR Newswire sources. In the third quarter of 1988, Commodore reported income of $9.0 million on sales of $200.3 million.

Total company income and sales for the first three quarters of the fiscal year are also substantially above last year's figures.

Irving Gould, chairman and chief executive officer, said, "We are pleased to report continued sales growth, particularly in the professional markets."

Gould added that demand for the Amiga 2000 and PC 40-III contributed to Commodore's success as the consumer market started to soften. However, sales growth in U.S. dollar terms was masked by a weakening of European currencies during the last quarter versus last year, according to Gould. European markets account for more than 70 percent of Commodore's total worldwide sales.

Gould concluded, "We are encouraged by our sales in the professional markets, where we are now committing substantial resources in order to realize future sales and profit growth."

¿ Quien Está en Grant's Tomb?

In addition to being entertaining, board games such as *Trivial Pursuit* can now be used as educational tools thanks to Gessler Educational Software (55 West 13 Street, New York, New York 10011-7958). Foreign language software versions of the popular board game were recently released by the company. Designed by the creators of the board game and a team of computer programmers at Oxford University, *Trivial Pursuit* ($39.95) is available in Spanish, French, and German versions. The games can be used by individuals, groups, or an entire class.

The software versions contain over 3000 questions in categories such as People and Places, Science and Technology, and Art and Culture. The questions incorporate sound, music, and graphics.

To begin the game, you must throw a dart to choose a random number to see who goes first. Just as in the original game, you start from a central hub; you move tokens to spaces highlighted on the board. When you land on a square, you are asked a question in that category.

Additional features include a score chart, a timer for limiting your response time, and optional sound.

Gessler is also in the process of designing foreign language versions of Pictionary and Monopoly.

Future Warrior

As Jason Youngblood, you are thrust into a desperate world of the future in *BattleTech: The Crescent Hawk's Inception* ($39.95), from Infocom (125 CambridgePark Drive, Cambridge, Massachusetts 02140).

This futuristic world is one of five Successor State planets fighting for supremacy. Jason, training to operate combat robots called BattleMechs, must defend his planet against invasion from the Kurita warriors. Jason's father, a legendary warrior, led a squadron to meet the enemy but has not returned. To save the planet and find his father, Jason enters the battle, and you must help him succeed.

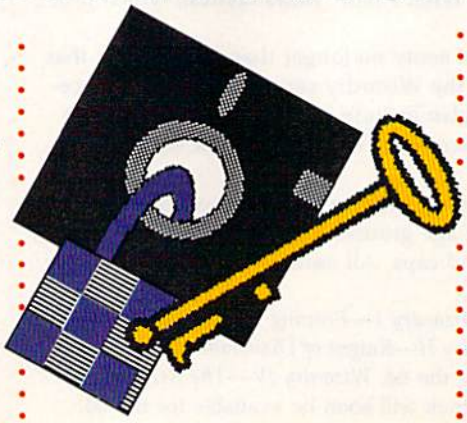
Jason and his party of warriors can travel to more than 4 million different locales, making *BattleTech* one of the largest computer role-playing games ever produced. Game features include the opportunity to increase your character's intelligence and weaponry during gameplay while collecting an inventory of hardware and equipment.

Infocom has used animated graphics or "emotive outtakes" in the style of Monga, a type of Japanese comic, to help illustrate battle action and a character's emotional responses.

What's the Password?

Users of 1541 and 1571 disk drives can now secure them with passwords by using *Lock-It* ($29.95), from Magus Software Systems (P.O. Box 050256, Staten Island, New York 10305).

The program places a complete, self-operating password system on your file disks (it does not support CP/M-format disks). The system disk is used only to implant the security on your disks. *Lock-It* occupies 4 percent of a 1541 disk's space and 2 percent of a 1571 disk. Log-in or log-out sequences have execution times of 30 seconds.

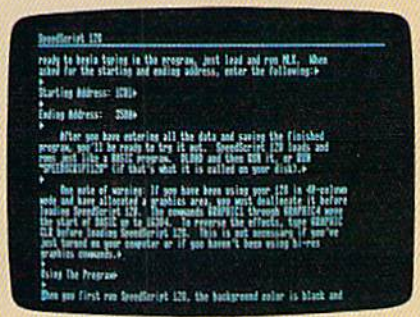


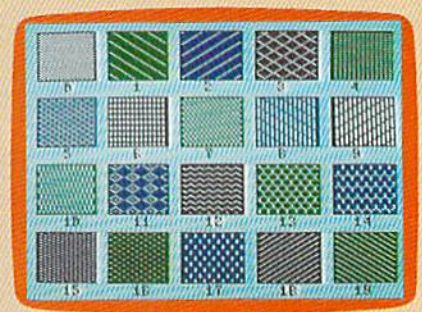
Once the system has been activated, the directory and your files cannot be read without the password. Passwords can consist of up to seven characters and can be changed for a disk without reinstalling the system on the disk.

Magus plans to offer upgrades for the 1581 as well as CP/M-format software in the near future.

BUILT FOR SPEED

Now Get Inside Your Commodore with *COMPUTE!'s Gazette Disk.*





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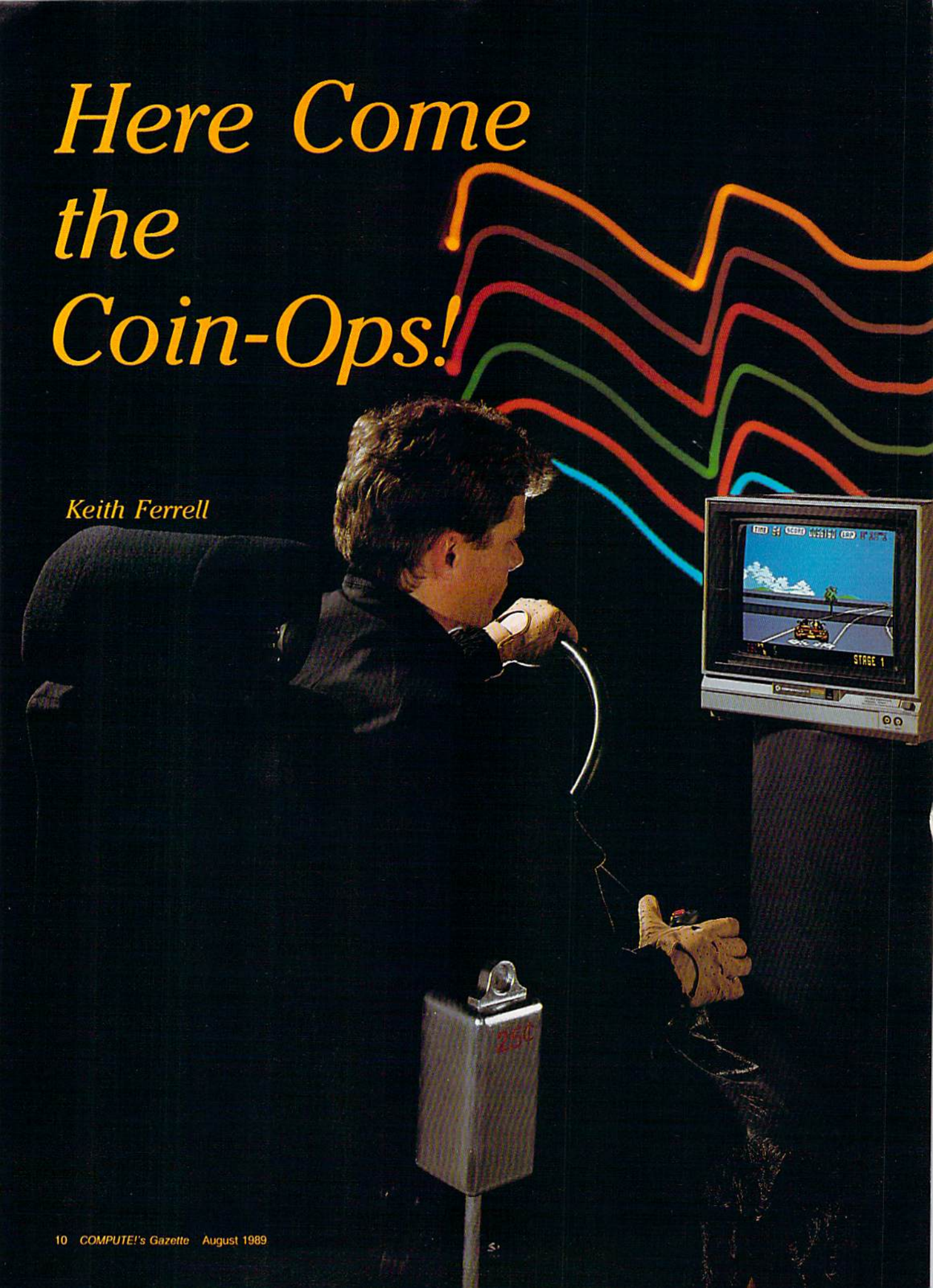
Here Come the Coin-Ops!

Keith Ferrell



Arcade games are hotter than ever, and the hottest of all are coming to your 64. Here's how the experts are making the jump from coin slot to disk drive.

Want to see next year's top games for the 64? Try visiting a coin arcade today. We're in the midst of an arcade renaissance. New technologies and new approaches to coin-operated action have brought jet fighters, hot cars, covert commandos, robot cops, ghosts and goblins, and all manner of digitized deviltry. It's a growth industry, and it's growing out of the arcades and into home computers.

The arcade resurgence largely flows from Japan—and if you want to see some *wild* arcades, pop a hundred yen into a coin slot in a Tokyo game parlor. They put ours to shame.

But the conversion of coin-op firmware to home computer software is taking place largely in the West, either through subsidiaries of the Japanese manufacturers or through outside licensers.

These developers have several things in common. They're committed to delivering as much of the arcade experience as possible to the home computer audience. They work continually to improve software tools for managing the conversions.

And, gratifyingly, in a year when more than a few software publishers backed away from the 64, they're committed to this audience.

We talked to some of the leading arcade developers to find out what it takes to move a game from a stand-up coin machine to the 64.

Sega: Putting the Player Inside

First things first is the rule for conversions at Sega, says Manlio Allegra, one of the partners in International Development Group (IDG), which converts Sega arcade hits to disk-based software.

"First of all, from a design standpoint," Allegra says, "you have to decide what the essence of the game is, what makes it stand out. In *Thunderblade*, for example, it's the perspective, the way you put the chopper between the skyscrapers. In *Afterburner*, it's the speed, the different flying objects coming at you. That's number 1: picking the essence of the game."

That essence becomes the target, with tradeoffs selected to keep the essence as pure as possible. And there are tradeoffs involved in translating a coin arcade game to the 64.

"In a coin-op," Allegra says, "you're working with powerful microprocessors—the 68000 family—in parallel. It's like having two or three Amigas, plus special graphics chips. You don't have that on the 64.

"But the 64 is definitely a good arcade machine," Allegra says. "In terms of music and sound effects, the 64 is superior to the Nintendo, although Nintendo graphics are probably superior to the 64's.

"Because 64 hardware can be a little bit erratic, we test the software extensively," Allegra says. It's part of an ongoing process that results in a home computer version of a game about a year after the coin-op edition hits the arcades.

For the first few months, little is done. The coin-op has to establish itself and begin fueling the word of mouth that is vital to an arcade game's success. When IDG begins the conversion, the work is hard and challenging.

"There's lots to do. We go to people who are expert in the particular areas we're trying to capture, whether it's graphics, sound, speed. With games like *Out Run*, speed is vital—fortunately, there are some good routines available for generating screen speed on the 64."

Music, too, plays a major role. "It's one of the keys to total involvement in a game," Allegra says. "It's very important. Good music and sound effects put the player right into the game."

Which is exactly where Sega wants the players to be. ▷

Sega's **Out Run** *(64 version)*

Taito: Getting the Feel

Graphics, music, action—these are important aspects of an arcade conversion, says Alan Fetzer, president of Taito Software. But not the most important.

"Those are subchallenges," Fetzer explains. The biggest challenge? "Reproducing the gameplay itself, the *feel* of an exceptional coin-op game."

But feel is an intangible, hard to come by. "You can have all the graphics, all the sound, all the action—and people may play and say it's just not any fun."

How do you capture that intangible and put it in the Commodore audience's hands? "We do a lot of final-stage testing and fine-tuning," Fetzer says. "Our game testers make recommendations regarding levels of difficulty, speed, and so on."

Then Taito's programmers tweak and adjust the game. "Programmers now have a lot of custom, technical tools that allow them to achieve the highest level of graphics, the machine's full potential," Fetzer says.

Taito's* Sky Shark *(coin-op version)

Another tool is communication with Taito's coin-op designers. "Our consumer programming people consult with the coin-op side. There are preliminary meetings and discussions, a storyboard is used—all of it aimed at reproducing that arcade *feel*."

The hard work is vital. Arcade software is an intensely competitive field. "Players these days are increasingly sophisticated. A lot of them have been burned, and they're on the lookout for quality."

To satisfy that savvy player, Taito sticks to certain rules. "We never give up the basic structure of the game, the main characters, weapons, action—all of it appears in the Commodore 64 version, just like in the coin-op arcades."

When sacrifices are called for, they tend to be in the level of detail in the graphics or constraints put upon the sound.

The conversion challenge calls for people Fetzer flatly calls artists.

"The best arcade games are art, and the best game creators are artists.

"You've got a group of people who combine hacking skills and artistic skills," Fetzer explains. The combination can be powerful.

Fetzer is especially proud of the music in *Sky Shark*, which was composed by one of these artists, using an unusual instrument.

"*Sky Shark*'s composer programmed the music on a hexadecimal calculator during the train ride to his office," Fetzer says. That's a different, digital drummer that still amuses, and amazes, Fetzer.

Data East: Ten Years and Counting

While Data East was founded in 1979, the company's software division did not come into being until 1985. It has made up for lost time since then, releasing both translations of arcade hits such as *Karate Champ* and original adaptations such as *Platoon*.

When doing a coin-op conversion, Data East tries "not to concede on graphics and the feel of a game," says Mark Beaumont, the company's vice president of marketing and product development.

Of course, some concessions must be made. "Because you don't have the raw power on a 64 that an arcade machine provides, you do have to give up some things," he says.

Such as? "You might have a slightly lower number of levels or fewer enemies on the screen, that sort of thing. The key is to start with the essence of the game and get as much of that to the computer as possible."

It's not necessarily easy. "There's a general rule of thumb for success in the home arcade market," Beaumont explains. "A game has to be easy to learn, but difficult to master. You have to provide an ongoing challenge. It's our job to make games fun and interesting—the better the game, the happier the player."

There's an advantage to working with products already proven in the arcade market. "The

Data East's* Robocop *(64 version)

prework is already done," Beaumont says. "While it [arcade conversion] takes a lot of time—seven to eight months for *Robocop*—it's still faster than original development."

Some of the challenges of a conversion are unexpected. Because many of Data East's products begin in Japan, conversions can be cultural as well technical. "Sometimes we have to 'Americanize' the games, to make sure they're recognizable to our audience."

With titles such as *Robocop*, *Platoon*, and *Batman*, Data East, like other arcade developers, has faced criticism for excessive violence. It's a charge Beaumont denies.

"Clearly, we don't believe our products are too violent," he says. "Certainly we don't glorify violence. An element of violence is found in all aspects of the entertainment marketplace. But there's not extreme violence in our games."

More people enjoy the games than criticize the violence. Many of those satisfied customers are Commodore 64 and 128 owners, an audience Beaumont obviously enjoys reaching.

"The Commodore audience is doing great for us," Beaumont says. "The rumors of the machine fading away are still not true."

Equally untrue are statements that the 64 is "programmed out," that there are no new challenges. "There's a core of programmers

still trying to beat the Commodore to death," Beaumont says. "I think sound is the next frontier, where the next surprises will come."

Data East is determined, to corner at least part of the market with its surprises.

Capcom Comes Alive

Founded in 1983 by Kenzo Tsujimoto, Capcom has come a long way in a short time. Well-known in arcades for hits such as *1943* and *Ghosts and Goblins*, the company quickly opened a U.S. office from which flow disk-based conversions of arcade hits.

Capcom's* Ghosts 'n Goblins *(64 version)

Phil Ho, Capcom's sales administrator, explains that Capcom looks for three main areas of interest when working on a game: "Playability, graphics, appeal to the public—those are the major concerns."

While he doesn't single out one element over another, it's clear that mass appeal is the dominant goal.

That goal is supported with a variety of development efforts. Capcom's development time for a coin-op game machine is between seven months and a year. With the coin-op in place, Capcom undertakes conversion to computer formats, which include Nintendo, MS-DOS, and Amiga, as well as the 64.

Some aspects of the conversion are simpler than others. Ho points out that sprite and screen manipulation on a 64 is not too different from that on an arcade machine. Capcom strives to maintain the same level of speed and excitement on the computer that's available for a quarter at the arcade.

Other questions are tougher. "We spend some time deciding if the game is convertible to disk," Ho says. "Actually, anything is convertible. These days anyone can translate anything. So, what we do is determine how well we can manage the conversion."

Conversion is not as time-consuming as development of the stand-alone arcade machine. "We can generally manage a conversion in four months, although each game is different; *1943*, for example, has 24 levels and has taken seven months of conversion time so far."

There are always tradeoffs involved in moving from the power of a game machine to a home computer. Sacrifices must be made. "*1943* is a good example. The arcade version was a two-player game, but that proved unworkable on the 64. So we took it to one player."

For every tradeoff, though, there's a gain. Lately, music has played a more important part in Capcom's Commodore packages. Ho is intrigued with the sound capabilities of the 64 and anticipates an increase in the use of sound.

What does Ho like best about the Commodore marketplace? "The wide variety of players there—you have the chance to appeal to almost everyone, to different tastes and interests." **G**

MicroProse: Flying the Other Way

For MicroProse, it all started with coin-ops, recalls company founder Bill Stealey.

"Sid Meier [Stealey's partner] and I were playing an arcade game called *Red Baron*, years ago," Stealey says. "And we both felt, 'We can do better than this.' So we decided to try."

Their attempt was wildly successful. With an unbroken string of combat flight-simulation hits including *F-15 Strike Eagle*, *Gunship*, and *F-19 Stealth Fighter*, MicroProse is the preeminent developer of armed computer aviation.

But Stealey and Meier wanted more.

And they wanted more than could be achieved on even advanced home computers. Their eyes turned toward the powerful hardware found in coin arcades.

Stealey had been approached by coin-op manufacturers before. "But they all wanted to license products like *Gunship* for ridiculously low fees, which didn't make any sense. I knew we could do a better job ourselves.

"So, I asked Sid to tell me what he must have to make the world's best flight simulator. We got started, hired a consultant, spent lots of money, got an idea of what was in store."

Stealey and crew got an intensive education in the coin-op world. "Coin-ops are wonderful sprite machines," Stealey says. "But I didn't want sprites. I wanted 3-D polygon graphics."

More consultants, more engineers. "Finally, we decided to do it ourselves, starting from ground zero."

Stealey assembled an internal team, headed by Gene Lipkin, an industry veteran who'd been at Atari during the Nolan Bushnell days. "The software was already started. By February and March, 1988, we had engineers, and the design was basically in place. We spent another six months verifying that design, maximizing the performance."

The goal? Not just "the world's best flight simulator," but also a game that would break out of the traditional audience.

"The whole idea is that coin-ops are aimed at only a small percentage of the world—adolescent guys. We wanted to do more."

In order to reach a more adult audience, Stealey says they had to come up with something that offered an experience beyond "flying for 90 seconds and getting blown up."

He's adamant on this point. "We won't do that. Our game is tough, but it's also realistic. If you're good, you get to play for a long time. That goes against the economics of the business in some ways."

Aware that he is violating some traditional arcade rules—make destruction come quick so you can get another quarter out of the mark—Stealey is nonetheless confident that the game experience his machine offers will overcome objections.

"We've got something no other coin-op has," he says. "In most arcades, there's one solution to each problem. The railroad tracks run A to B. We've got *thousands* of solutions to each problem. Because we're using 3-D graphics, we've got whole worlds rather than just screens with sprites. It doesn't matter what comes next—you can go anywhere."

That last point—*you can go anywhere*—could almost be the irrepressible Stealey's motto. If his arcade machine—as yet unnamed but, with luck, in release by late fall—soars as high as he hopes, it could be the first sign of a resurgent American arcade industry.

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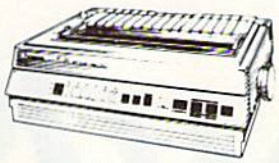

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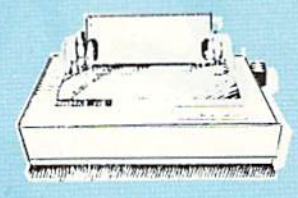

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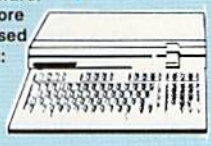

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Explore Your 64

Are you getting the most out of your computer? Readers often ask columnist Larry Cotton just what personal computers (especially the Commodore 64) are good for. Here's his answer.

Larry Cotton

What can you do with the 64 besides play games, write letters, and chat with friends via modem? That's a good question, but one for which I have a lot of answers. The computer is so versatile that it's easy to miss the forest for the trees and ignore many of its applications. Here's my list of favorite uses for the Commodore 64.

Write a Column

Write a monthly column for a magazine specific to your computer, preferably in the area of your greatest expertise.

Write Programs

Write programs (and sell corresponding articles, if possible) which could accomplish one of the following tasks:

☞ Make the 64 simulate an electronic music synthesizer. Songs could be played on the keyboard; the computer could randomly generate the sounds. *Patches* (a set of parameters that defines a sound) could be saved to and loaded from disk.

☞ Make the 64 emulate an electronic drum machine, primarily by using SID's noise waveform. Beats could be played on the keyboard; sequences could be memorized and played in a loop as accompaniment to other instruments.

☞ Let a child paint—under joystick control—multicolored blocks or characters on the screen, which would be split vertically. Anything drawn on the right side of the screen would be mirrored on the left.

☞ Encourage people to create and modify sounds, under control of the joystick.

☞ Use the 64's wonderful sound-generating abilities to play three-note chords in the chromatic scale, which could be changed (voice, envelope, pitch, harmonic structure) on the keyboard to accompany vocals or instrumentals.

☞ Take advantage of two of SID's voices to generate touch-tone telephone sounds—to be used as an electronic telephone dialer. A mini database could be included for use as a directory.

☞ Let kids (and adults) create lists, anything from friends' telephone numbers to glossaries to class notes. An alphabetizing routine would be a nice touch, written preferably in machine language for speed.

☞ Let the computer organize, and the printer print, the contents of your disk directories in three-column alphabetized format, exactly the width of a disk sleeve. Disk-reading and alphabetizing routines should, again, be in machine language for speed.

☞ Demonstrate various uses for the computer's RND (RaNDom) statement, such as tossing dice, dealing cards, timing reactions, or creating sprites.

☞ Use sprites to display the actual plot of one of

the 64's waveforms and envelopes of a sound.

☞ Demonstrate unusual creation of, and applications for, sprites.

☞ Generate sound effects from the keyboard. Sounds could be saved and loaded from disk and played sequentially on the keyboard.

☞ Use the computer as a music processor. Sprites could be used to represent the musical notes in the treble and bass clefs. The notes could be moved up and down with joystick control. Entire songs could be quickly created, saved to, and loaded from disk.

☞ Use the computer to record, organize, and even *create* recipes, in a specially tailored mini-database format. Recipes could be saved to and loaded from disk and printed out.

☞ Cause the printer to dump multicolor-mode, hi-res screens to a black-ribbon printer, one color at a time, using solid squares to represent each pixel of a particular color. The printouts could be blown up to create large silkscreens.

☞ Create graphic artwork on the printer, using mathematical formulas.

Be Funny

Write a humorous article on an enhanced BASIC language.

Get Technical

Write an article on changing the 1541 device number; consider various constructions of the 1541.

Learn Electronics in Your Own Home

Build computer-related projects, such as these:

☞ "Plodder," a slow four-color magic-marker plotter for creating 24 × 36 inch drawings, using some of the techniques noted above. It could be interfaced with the user port.

☞ A MIDI (Musical Instrument Digital Interface) "cartridge" that could also plug into the user port. Software could be in BASIC, if not planned for use in realtime performances.

☞ A robot drummer, again interfaced with the user port. Up to eight "drums" could be played with "sticks" controlled by battery-powered solenoids.

☞ Hardware and software that would create a floor plan from an existing home or office space. The room-measuring instrument, based on a rolling-wheel counter, could interface with the user port. Floor plans could be drawn on a hi-res screen as they are measured from the room.

☞ An on/off switch for fast-loader cartridges, so the cartridges don't have to be physically removed from and inserted into the computer.

☞ A speech synthesizer, using off-the-shelf components, interfaced with the user port.

I know that all of the ideas listed above are feasible because, over a period of seven years, I've accomplished them all. **G**

A Dozen More

Here are a dozen more ideas and projects, that, to my knowledge, are waiting to be executed.

1. Have one 64 play music on another.

2. Make both 64s, in sync, play six voices—in stereo!

3. Display hi-res pictures or other graphics in sync to music on an audiocassette, using the computer to generate, then sense, the sync pulses on the cassette.

4. Have the computer answer the telephone, using the above speech synthesizer or commercial speech-generation software—or even with a *digitized message of your own voice.*

5. Make the computer control a multimedia sound-and-light show. It could even be an active participant.

6. Sync several computers together to generate their own sound-and-light show on giant projection-TV screens.

7. Have the computer monitor and/or record up to eight characteristics of the environment (light, temperature, sound, humidity, cloud cover, vibration, and so on).

8. Program a hi-res screen manipulator that freezes and then zooms in on *any* fractional part of *any* hi-res screen, then allows the user to multiply, move, reverse, mirror, recolor, or rotate it. (This one is far beyond my programming ability).

9. Build a simplified, unsophisticated version of a video digitizer.

10. Build a scanner that attaches to a printer. A photo or drawing feeds itself through the printer, which digitizes the image and sends it to the computer, where it is to be manipulated by the hi-res manipulator (see number 8 above).

11. Have the computer actually listen to a musical instrument, using the 64's audio-input port, and announce (by speech synthesis or an onscreen message) when the instrument is in perfect tune.

12. Create an algebra word-problem–solving program. (If adventure games could only be so smart!)

REVIEWS

Guerrilla War and *Purple Heart*

Two new games for the 64, *Guerrilla War* by Data East and *Purple Heart* by CRL, create a two-player environment in which a single player should think twice about entering alone.

Guerrilla War is not a game about apes in the city zoo, and *Purple Heart* is not a mild-mannered tale of a color-blind heart surgeon. Both are arcade-style adventures in which you go to war against impossible odds. If you're smart, you'll convince a friend that his or her fighting prowess and combat skills are required for this campaign of thrills.

Of the two games, *Purple Heart* is the sleeper. Packaging is unpretentious, and the introductory graphics are pretty much what you would expect from a "mercenary shoot-'em-up."

When the game gets under way, however, it sweeps the player(s) along on a mad, frantic charge through five complex and challenging levels of play. The advantage of having a friend along becomes apparent as the two players share the same action and discover they must cover each other's flanks from the onslaught of enemy troops.

Cobra is the code name of mercenary (player) 1. He is joined by his companion, Striker, when the two-player option is chosen. Using captured weapons (machine guns, rocket launchers, and flamethrowers) freely stockpiled along the way, you dart from behind buildings and parked vehicles, destroying all who would oppose your mission.

This is not easy: Your foes outnumber you 100 to 1, and the bullets and deadly grenades sprayed your way fill the screen at a dizzying rate. Military vehicles also speed along the roadway, creating hazards and havoc and flattening unwary mercenaries.

Each mercenary has the ability to take five hits as he fights through the five multiscreen scenarios. The Enemy Base, the Jungle, the Ruins, the Swamp, and the Icelands must be traversed and conquered before a final victory can be claimed.

Thanks to good programming and good design, the makers of this war adventure provide users with the ability to return to the game at the level where their last player expired. This is a blessing to those of us who haven't the patience or inclination to restart a game from the beginning each time we want to play again.

There's also an option for a second player to join a game in progress. Simply plug in a second joystick, press the space bar, and Striker appears on-screen, ready to aid his friend, Cobra.

I'm impressed with how much fun this game is to play. The action is fast and furious, but not unrelenting. You have a chance to catch your breath and collect your thoughts before reentering the fray. The graphics are exceptional and clearly defined, allowing hours of play without eye fatigue.

CRL has a hit with *Purple Heart*.

Data East has offered a number of its arcade hits to the home computer market and with a fair amount of success. Its latest effort is *Guerrilla War*, a game, like *Purple Heart*, that allows two players to enjoy a shared crusade.

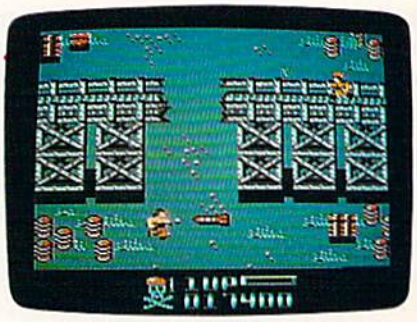
Guerrilla War challenges players to overthrow a cruel dictator in a freedom-loving republic. Your mission is to free your fellow guerrillas imprisoned in the capital palace.

***You'd best take a friend along if you want to survive in* Purple Heart *and* Guerilla War.**

Stop me if you've heard this before, but you must fight your way through five levels of difficult play to reach your objective. A farm, a town, a coal mine, the capital, and, finally, the palace are your battlefields.

Besides using guns, bazookas, and flamethrowers, each player can carry and use 50 grenades. Your foes are well-armed and entrenched in foxholes and bunkers, or rapidly deployed from marching columns on the roadways. Getting through them is not easy. Expect additional trouble from above: The government controls air cover.

The game offers a choice of keyboard or joystick control. Trying to manipulate the play with the keyboard was awkward, however, and made me appreciate the fact that I had several good joysticks.



Purple Heart

At the end of each session, or when you lose your last life, not only must you restart from the beginning, but you must also answer the option prompts again. The graphics are not the best I've seen from Data East; they flicker and jump to such a degree that it becomes downright disturbing.

To its credit, *Guerrilla War* is a fast-paced and most challenging arcade-style war adventure. The well-executed soundtrack can accompany your mission or be switched off in lieu of battlefield sound effects.

Sharing a computer adventure with a friend is a welcome trend in gaming, and, now that computer games are becoming truly multiplayer, I wonder how far this might be taken. Should we expect to see future games played by a large number of people using linked computers or telecommunications? Imagine a sports or war game using 20–30 participants. That could really put a dent in my computer escape time when I'd rather be alone.

—Steve Hedrick

Purple Heart
CRL
Distributed by Scorpion
19 Harbor Dr.
Lake Hopatcong, NJ 07849
$29.95

Guerrilla War
Data East
470 Needles Dr.
San Jose, CA 95112
$29.95

Bible Search

Need a New Testament reference to write a sermon, assist you in your biblical studies, or provide an answer to a nagging question? *Bible Search* is a quick way to find those references, look at them in context, and print them out.

> *. . . an enormously quick and responsive program of value to anyone studying the New Testament.*

Bible Search contains the full text of the King James Version of the New Testament, with a complete concordance. The concordance is available on a variety of disks for use with the REU or the 1541, 1571, or 1581 disk drives. The program itself has to be run from a 1541 disk. There are two separate programs for the 64 and the 128, both on the same disk. Nearly everyone who has a 64 or 128 also has a 1541 disk drive or a 1571 that can emulate it. Those with REUs or 1581 or 1571 drives will appreciate the extra speed this equipment affords, though the disk turbocharging routines make the 1541 very fast. Whatever equipment you have, you can copy the files from disk to disk using any file-copy utility: The disks that come with *Bible Search* are not copy-protected, which makes sense. Who would sink so low as to pirate the Bible?

When you run the program, you're prompted for a search string. After you've entered the string, an initial search is performed through a concordance to make sure the text appears in the New Testament. If it doesn't, a portion of the concordance close to your word choice will appear. If you search for the word *frog*, for instance, to find out what happened to frogs after they overran Egypt shortly before the first Passover (Exodus 8:2–7), you'll be informed that the word doesn't appear in the New Testament. Then the concordance will appear with your cursor on the word *fro* and just ahead of the word *frogs*, which apparently does appear in the New Testament.

As you might expect, these humble amphibians are conjured up as a vision of Armageddon in Revelation: "And I saw three unclean spirits like frogs come out of the mouth of the dragon, and out of the mouth of the beast, and out of the mouth of the false prophet."

When the searched-for verse appears, you can use the cursor keys to move forward or backward from the reference to see it in context. If you wish, you can print the text with your line printer. You can install a bookmark. You can look at the verses in which the search string appears, or you can opt to see all the references.

The options for searching are many and varied. You can begin the search anywhere in the New Testament. You can enter a phrase or a word. There is a limited capability to use wildcards. Or you can limit your search to a single book. Furthermore, you can enter a specific verse and call it up. When the texts are onscreen, they are fully formatted in upper- and lowercase, with the words of Christ in red; italic characters (which indicate clarifications by translators in words not actually contained in the original texts) are displayed in another color. Paragraphs are marked by dollar signs. All of the colors in the display can be customized, including background color and (in 40-column mode) the border color.

This is an enormously quick and responsive program that would be of value to anyone studying the New Testament. One small quibble: This is billed as a *Bible* search, but only the New Testament is included. The author notes that if he had gone all the way and provided both testaments, it would have required 4.5 megabytes of storage—16 double-sided 5¼-inch disks, or about six 3½-inch disks. To me, that doesn't seem excessive. I hope SOGWAP will consider expanding this program, perhaps even to include the Apocrypha, and making a version specifically for a hard drive. Bible scholars on a budget would thank them.

—Robert Bixby

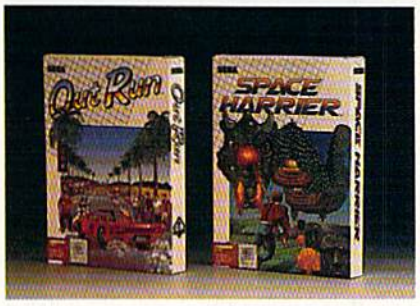
Bible Search
SOGWAP Software
115 Bellmont Rd.
Decatur, IN 46733
$25.00

Out Run and Space Harrier

You've seen Sega's *Out Run* and *Space Harrier* at your local arcade. Now you can bring these two megahits home to your 64. Everything is here: the beautiful graphics, great sound effects, and fast gameplay. Everything, that is, except the coin slot.

Of the two, *Out Run* is my personal favorite. As a general rule, I'm not a big fan of games that have been ported from the arcade to a home computer. They usually become entirely different games because of hardware limitations. But *Out Run* is an exception. The overall look and feel of the game is remarkably similar to the original.

You start by choosing one of five destinations, and the computer plots an overhead view of the course you'll be driving. Whatever course you drive, you'll see a variety of scenes from such locations as the beaches of Southern France, the German Autobahn, the Swiss Alps, Death Valley, and more. Wherever you travel, you'll be impressed with the smooth-scrolling graphics. Trees, buildings, bushes, boulders, and road signs whiz by in dazzling color.



Controls are straightforward and easy to operate. Push the joystick left and right to steer, or forward and back to accelerate and brake. Change gears by pressing the joystick fire button. (There are only two gears, so the button acts as a toggle between first and second.) At the bottom left of the screen, you'll find a functional tachometer and a speedometer. To the right, the current stage or checkpoint is shown. The clock, scoreboard, and lap timer are located at the top of the screen. A big feature of the game is the numeric displays, which are presented in big, bold digits that are easy to read—even at 295 kilometers per hour.

> *Everything from these two coin-op megahits is here: the beautiful graphics, great sound effects, and fast gameplay. Everything, that is, except the coin slot.*

After you've selected a course, adjusted the radio, and picked up your date, you're ready to hit the road. It's a race against the clock. Each leg of the race must be completed in 60 seconds. If you get there early, leftover time is added to the clock for the next leg. If you don't beat the clock, you're disqualified from the race. You must avoid

trees, rocks, buildings, poles, and anything else that borders the road. One slipup will send you tumbling end over end. Fortunately, crashing your car doesn't disqualify you from the race; it just takes valuable time off the clock.

Out Run

Completing a course is extremely difficult. After many hours of play, I finally managed to get through course A. This is possible only if you drive like a careful maniac. If you make it to the finish line, you'll be treated to a victory celebration. I won't spoil the surprise, but I will say that you'll be glad you brought your date along for the ride.

Just about every game, regardless of its merits, has its share of drawbacks. Here, though, I could find only two worth noting. The first involves the way high scores are handled. The top five drivers can enter their names in the Hall of Fame, but the names aren't saved to disk. Why bother if it's not going to be there next time you play? The second drawback is the demo mode, which involves a lot of disk access. You might not want to leave your computer on very long after you've played a game, or your disk drive will get a real workout.

The game is put together very well. The graphics are excellent, the sounds are good, and gameplay is fast. The guys at Sega did an outstanding job of recreating one of my coin-op favorites.

I remember seeing *Space Harrier* for the first time in the local arcade. My younger brother and I had stopped by there and we noticed a crowd gathered around a strange new machine. We had never seen anything like it. Not only did it have outstanding graphics and stereo sound effects, but the whole videogame leaned and dipped according to the action on the screen. Well, your 64 may not lean and dip while you're playing *Space Harrier*, but your stomach might. Once you see the impressive 3-D graphics and experience the fast-paced action, you may forget that you're playing on a 64.

Arcade games have come a long way in the last few years. Just when you think they can't get any better, something new comes along. The same goes for Commodore 64 software. With countless arcade releases on record for this computer, it still hasn't reached its high. Sega's *Space Harrier* is stunning proof that new and better things can still be done on the 64.

Space Harrier is a futuristic shoot-'em-up played in the 3-D Land of Dragons. You control the Space Harrier, a jet-pack–equipped Rambo with a big gun. Your goal is to seek out and exterminate all hostile beings and bring peace back to the land.

The game is played in a series of stages, each more difficult than the last. You'll encounter robots, stone-head creatures, helicopter insects, a nuclear man, dragons, and a whole slew of other deadly monsters. While doing battle with the creatures, you must avoid various obstacles scattered on the surface. These obstacles include trees, towers, poles, bushes, and rocks. They all vary in height, so you must fly between, over, and around them throughout most of the game. If you make it to the end of a stage, you must destroy a giant supercreature to advance to the next level.

Space Harrier

Clearly, the high mark of *Space Harrier* is its slick 3-D graphics. It's so realistic you'll probably find yourself leaning, ducking, and dodging the oncoming obstacles as if you were really there. Many arcade games use this 3-D perspective, but none have achieved the stunning realism of *Space Harrier*.

The biggest problem of *Space Harrier* is its lack of rapid fire. After about 30 minutes of play, I had a bad case of Thumbitis. (Of course, this varies with the quality of the joystick used.) Also, like *Out Run*, this game doesn't write high scores to the game disk. I hope Sega puts an end to this habit in future releases.

Space Harrier is an outstanding arcade game in all facets: graphics, sound, and gameplay. It's addictive.

—Troy Tucker

Out Run *and* Space Harrier
Sega
Distributed by Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$34.95 Out Run
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USA Today Sports Center

Who's not on first. And What's not on second. But Who is. I mean, who is?

Poor Lou. If only he'd had the USA Today Sports Center, he could have avoided all that confusion with a few seconds online. But thanks to USA Today and Linc Networks' recent collaboration to form the USA Today Sports Center telecommunications network, sports fans can have all the answers—and have a lot of fun. Members can participate in fantasy sports leagues, play board and card games, review team schedules, buy authentic equipment, swap or sell sports memorabilia, and see scores and updates as they happen.

Just a glance through the sports newsroom should give you a good idea of the variety of information available from the Sports Center. From here you can receive a customized news update every time you log on. Members designate favorite sports, leagues, teams, players, and subjects; the Sports Center clips and saves news articles that pertain to them. If you wish to read about other stories in the sports world, you can browse through all the latest news. A personalized scoreboard can also be set up to show you scores, standings, and box scores for selected teams.

The Sports Center is heaven for sports-statistics lovers, who will find information on a number of sports on amateur, college, and pro levels. Practically any statistic from the current sports year can be accessed online. Supply a date and a team or city, and up come the scheduled events. Pick a team and a player, and you get individual statistics. Also, you can easily make statistical comparisons between both individuals and teams.

You'll often find that statistics are displayed in 80 columns. This is probably because the network was originally designed for the IBM PC. Although annoying at first, reading through these stats becomes easier with practice.

After you've caught up on the latest sports info, you can get into the action yourself. But before getting started, you should find and read the member's handbook, which is offered online. It contains essential Sports Center information that will save you both time and money. Another time- and money-saving tip: Use the menus to navigate when first logging on to the network. Once you're comfortable with the system setup, you'll find that the direct commands are a much faster means of accessing different parts of the Center.

The Sports Center offers fantasy Rotisserie leagues for all major sports. Members can draft a team of players (with fantasy dollars) and manage them

in an online league competition. Statistics for your team's players are compiled from actual professional games in which their real-life counterparts compete. Teams compete throughout the season to determine a champion, and prizes are awarded to the winners.

Once you've finished any necessary trades and have your team in shape, you may want to explore the board- and card-game sections. (Before becoming affiliated with USA Today, Linc Networks was mainly a service for online chess players, and even today many of the members are board-game players.) Here you'll find chess, checkers, backgammon, reversi, go, blackjack, and more. Each game section features lessons, game news, and tournaments. Players achieving the highest score each week are eligible to compete for prizes in monthly tournaments. The games also feature ongoing tournament ladders where players earn ratings based on their performance and are matched with similar opponents. Forums are regularly offered with chances to chat and play with masters of the game.

Collectors and card dealers will especially like the Sports Center's collector exchange, where you can buy, sell, or trade baseball cards and other sports memorabilia. Up-to-date price guides are available for almost every major card issue, and there are several ways to sell or trade cards online. If you wish to trade cards, go to the public trading post. If you're interested in selling cards, check out the classified ads and live auctions. A future addition will allow buffs to catalog their collections and reference their values online.

This new online service is heaven for sports lovers.

Like most telecommunications services, Sports Center offers chat modes and E-mail. Weekly forums regularly feature USA Today experts, as well as other major personalities.

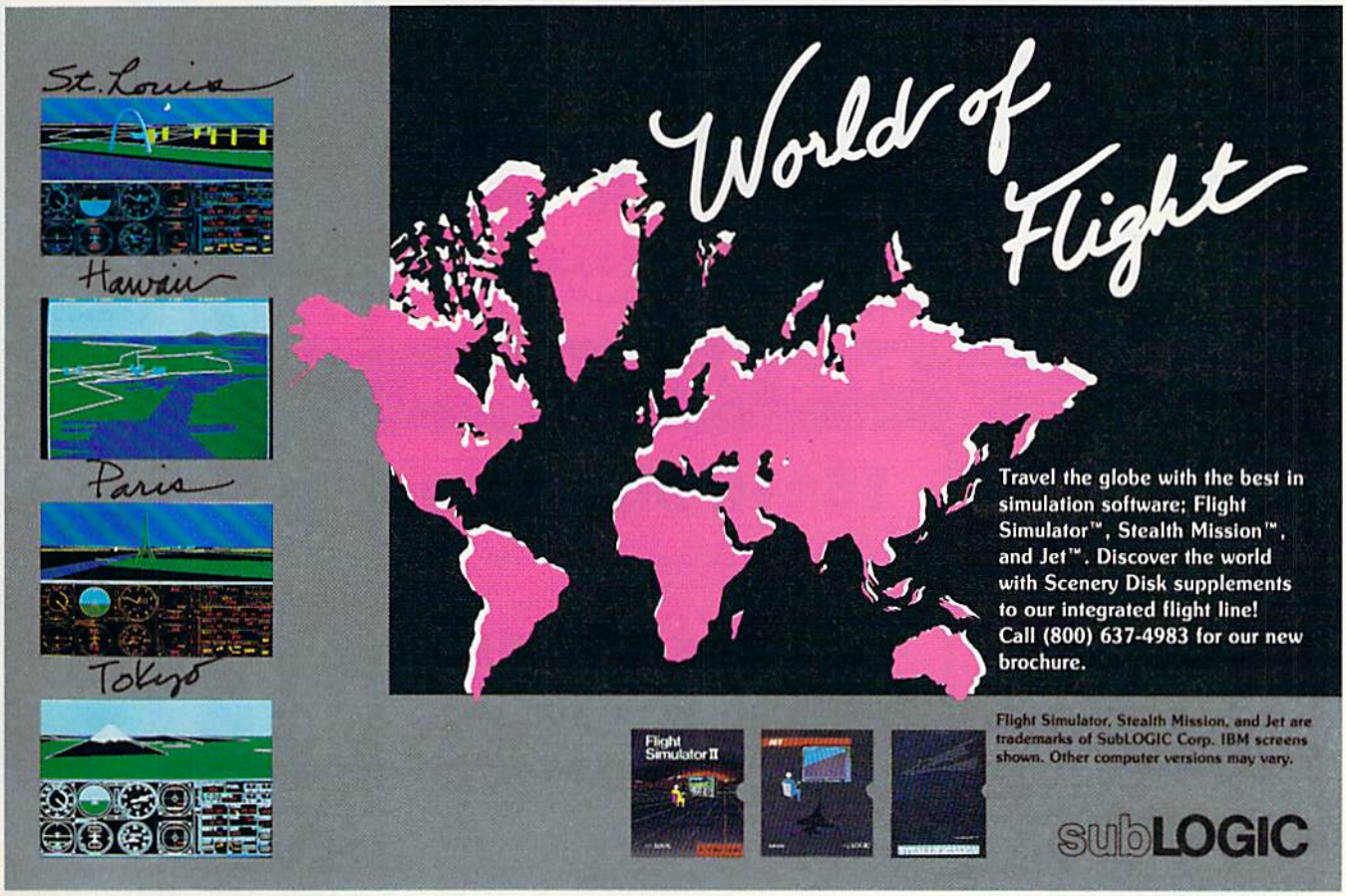
The Sports Center offers a wide variety of memberships, ranging from $14.95 (Individual) to $34.95 (Organization). The standard individual membership provides all the Sports Center services, and first-time members receive $15.00 of free online time. The service can be accessed from Tymnet, Telenet, ConnNet, 800 Service, and direct calls. Access charges start at $2.95 per hour and go as high as $17.95, depending on the time of day and the access method.

Optional Sportsware telecommunications software is avaiiable initially for $24.95 and is $29.95 if you purchase it at a later date. Its most significant feature is the sports ticker, a moving display along the bottom of your screen that brings you scores and updates on games as they happen without disturbing your current activity. In my opinion, this feature alone makes the software worth its price.

Sportsware also lets you configure your startup to automatically call the Sports Center and log you on. The board games can all be enhanced with Sportsware graphics, as well. Members who choose to use their own telecommunications software have the same network and game capabilities, but they must play text versions of the games.

An updated version of the software is planned in the near future. The update (supplied to existing members free of charge) will incorporate a disk-capture option for users who want to store information at home.

It doesn't take long to see that the Sports Center was very well planned and designed from the start. Online staff members are always accessible and eager to listen to new ideas on how to improve the service. I've used the network for just over a month, and it's obvious that the system is growing dra-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matically. New areas are constantly being added, and existing ones are updated often. In fact, there's not enough space in this review to even mention all of the current options.

I also don't have room to tell you who's on first. Guess you'll have to figure that one out for yourself.

—David Hensley, Jr.

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Aussie Joker Poker

The two of us like a game that can be played alone so we can test our blundering methods in private. We like a game that dares us to risk dollars in areas where we say our luck and superior skill are. When we feel like company, we like a game that can be played by up to (good grief!) 90 people. We like computer card games. We like *Aussie Joker Poker*, although it took some getting used to.

The object of *Aussie Joker Poker* is to score points. Each player's hand consists of five cards. A hand's score is determined by its poker value, the value of the cards, and the suits involved. You can either keep your cards and the score they make or risk your hand by having one to five new cards dealt.

> ***. . . different, down-under audacious, and cool.***

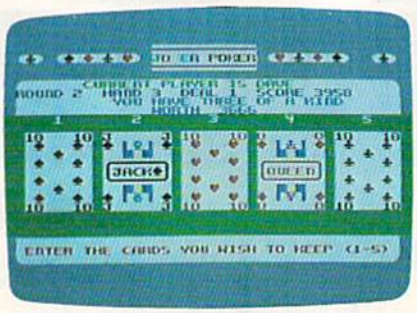
As long as you improve your score with new cards, you're in the game. You then have the choice of keeping that score or taking new cards again. If you don't improve your score, you bust and thus are unable to score on that hand.

You determine how many rounds to play and how many hands to have in a round. Suits may start at any card from 2 to 10, thus lowering or raising the odds for a good hand.

The program puts your hand in order, if you like, and tells you what top score you're up against. It also keeps track of all scoring and whose turn it is to start a round. The manual recommends playing as many rounds as you have players.

There is a way to place bets with this game. Just like the scoring, the program maintains all accounts automatically. The betting option can only be accessed by means of a code word, and it can be removed at the touch of a key. Bets can be set for any amount from $0.01 to $9,999.99.

It's easy to let players join or leave the the game. The computer settles accounts smoothly.



We like computer card games, and *Aussie Joker Poker* is different, down-under audacious, and cool. It's a slick program. For those of us who like to play cards on the computer, it's a bit of all right.

—David and Robin Minnick

Aussie Joker Poker
Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$29.95

International Team Sports

In software publishing, few themes are as popular as sports, especially Olympic sports. Dozens of programs have covered most of the individual Olympic events, but team events have mostly been ignored. The biggest problem is in one user trying to control several players.

One solution is Mindscape's new *International Team Sports*, a program featuring five team events: volleyball, the 4 × 400 meter relay, the 4 × 100 meter swimming relay, soccer, and water polo. Not only do you control the athletes playing the games, you also act as coach.

The program starts out at the first Sports Festival. After selecting a country to represent, pick seven players for your team from a pool of 11 athletes. You are given a rating for each player in each event, plus his age. After selecting seven athletes, assign them to the various events. (During subsequent Festivals, players' skills improve or decrease, older athletes retire, and new ones become available.) If you wish, you can let the computer make the selections for you. When your teams are ready, the games begin.

The five events can be played in any order. You can play a single game, play one round in an event, play an entire event, or play all the games of that year. You can watch the computer play or participate in any of the games you wish. All events are conducted in a playoff structure.

Mindscape has come up with an excellent interface to solve the one-player/multiple-athletes problem. Instead of controlling what each athlete does, you control the interaction between athletes, acting more as a super-coach than as a player. Fortunately, there is no joystick-wrecking action in any of these games. Anyone with average dexterity can play—skill counts here, not speed.

In volleyball, you field a three-man team. You control the passing and the shooting. Pass the ball to a teammate, hit it over the net, or, if the setup is good, spike it over the net. On defense, you control the blocking.

The players automatically move around the court, playing by your command. The graphics are good, and the play is fast. Details abound (the ball bounces off the back wall on a bad shot). The team that wins two out of three games wins the match, with game points set at 5, 10, or 15 points.

In the running relay, you pace the runners and time the baton passes. In swimming, as in track, you pace the athletes and control the turns and exchanges. In track, everything happens as soon as you press the fire button, but in swimming, you have to think ahead. When you press the fire button at the exchanges, you don't jump instantly into the pool—it takes a second to dive in. The idea is to leave the block just as

the swimmer in the pool touches the wall. Too early, and the diver freezes up. Too late and you lose time.

There's one problem here. Pool lanes aren't shown on a split screen. The view follows the leader, and, if your team is behind, it becomes almost impossible to time the turns. If you're in the lead, that presents no problem, but if not, learning the game can be difficult. Remember, the athletes' skills affect how fast they swim or run. They can go faster and tire out, or go slower and conserve energy. You have to pace your athletes to achieve the fastest laps possible.

Soccer and water polo are con-

trolled the same way but play differently from swimming and track. You handle the passing, shooting, and covering, while the computer moves the players. Here, a player's skill determines shooting accuracy and how fast he moves on the field or in the pool.

Play is simple. In both soccer and water polo, you have four players: left and right wingmen, center, and goalkeeper. To pass, push the joystick in the direction you want and tap the fire button. To shoot, hold the button and release.

In soccer, timing the release is unimportant, but in water polo it determines how high the ball is thrown. You'll lob a few balls off the screen until you get the timing right. In both games, passing is critical. If you're like me, you may have a problem remembering the correct controls. Too often I've shot when I meant to pass and lost the ball. I recommend a good joystick.

International Team Sports is a very good product. Graphics and sound are excellent, action is quick and clean, and controls are simple. The manual is detailed and explains all aspects of the game. There is a problem with drive access—and fast loaders don't seem to help. I have yet to see a game that takes longer to load, but if you don't mind the wait, *International Team Sports* is a good piece of software. And it's a lot of fun.

—Erik Olson

International Team Sports
Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$29.95

F-14 Tomcat

Yet another flight simulator inspired by the movie *Top Gun*? Yes, but this one is easily the best of the lot and one of the best combat flight simulators for the 64.

Produced by Dynamix, which won its spurs three years ago with a futuristic combat tank simulation called *Arctic Fox*, *F-14 Tomcat* offers outstanding graphics, good sound, fast action—and a career as a naval aviator.

You begin by enlisting in the Navy and viewing a montage that takes you through boot camp. You are then assigned to flight training at Whiting Naval Air Station, where your first flight is in a T-2 Buckeye. Here I discovered an anomaly. Although this trainer is propeller-driven, you're instructed to increase thrust as if you were in a jet. Further, the sound effects are those of a jet engine.

As in all the good simulators, your view is through the windscreen, although ground details are sparse. Even at low altitudes, the land is indicated by a green field with rows of white dots that change to give some feeling of movement. Occasionally a major artifact, such as a landing strip, comes into view, but these are few and far between.

F-14 Tomcat ***is one of the best combat flight simulators for the 64.***

The control panel, on the other hand, is nicely detailed, using gauges rather than the electronic displays found in other simulators. A welcome touch is the inclusion of different panels for the T-2 and the F-14. While such a difference should be a matter of fact, it is not always so. This extra effort to provide variety and realism speaks well for the quality of *Tomcat*.

Your mission is outlined by radio messages that appear at the bottom of the screen, beneath your control console. Fly to the listed altitude and heading. The game is forgiving at this point, and an error of a few degrees or a few hundred feet doesn't matter.

On your second flight, follow your instructor through basic maneuvers; then move on to air combat maneuvers. From there you're ready to go to Pensacola NAS for advanced jet training, flying mock combat against an instructor. (Fail and you'll likely end up flying cargo planes or helicopters.)

If you succeed, you may be posted to Miramar NAS, but only for further training. As yet you don't have the age or experience to take part in the Top Gun school. Besides keeping a record of your training, accumulated points, and rank advancements on a separate disk, *Tomcat* ages you as your career progresses. You begin at age 21, but you have to be 28—if you live that long—before you can hit the big time.

Accept a posting to the U.S.S. *Nimitz* and join one of two squadrons keeping a lid on hot spots all over the world. It's only after this and after attaining an overall score of 85 or better that you can go to Top Gun school. If you're successful there, you may even be invited to return as an instructor.

Each duty station along your career path represents an escalation in the difficulty of the game and in the quality of your opponents.

Should you not wish to pursue a career, go directly to the Fly Mission part of the simulation. You'll help suppress hostilities in as many as 80 trouble spots, but your scores will not be recorded.

The missions are not necessarily all combat missions. At times you may be sent up as a show of force, directed not to fire unless fired upon. At other times you may go into action with weapons hot, ready to fire at anything that moves.

While flying, send radio messages by using the numbered keys. Press 1 to request permission to fire at the enemy. Press 2 to request a vector for your base, and so on. These messages and their replies appear on a line below your control panel.

If you're shot down, you'll be treated to a still scene showing your plane going down in flames, followed by another of your flag-draped coffin being borne by your shipmates. Fortunately, death is not permanent, and you can quickly fly again without rebooting.

Because of its extensive graphics, *Tomcat* is a large program, occupying four disk sides. Yet all the scenarios I've tried can be completed without swapping disks.

F-14 Tomcat's graphics are excellent. Your control panel and heads-up display are uncluttered and easy to read; enemy planes grow from dots to what looks like real aircraft; and the scenes of receiving orders or being shot down are also very good.

Documentation covers everything you need to know without being overbearing. In addition, there are several illustrations of the flight maneuvers you'll be expected to perform, along with good examples of how they work and what they do.

Control is a mixture of joystick and keyboard, and I'd recommend using the smoothest joystick you have. Leaf-contact types, such as the Wico Ergonomic and the Epyx 500J, will sometimes click you into a position a few degrees off axis, making it difficult to level yourself with the horizon.

Keyboard controls could be more easily mastered with the help of a quick-reference card; nevertheless, *F-14 Tomcat* earns top honors. Graphics, sound, and action are excellent, and the framework of a career scenario adds a sense of realism and purpose.

—Ervin Bobo

F-14 Tomcat
Distributed by Activision
P.O. Box 3048
Menlo Park, CA 94025
$39.95 **G**

EDITOR'S CHOICE

BOOMERANG

If you like fast-action games requiring lightning reflexes, then "Boomerang" is for you. Two players go head-to-head in this exciting survival game for the Commodore 64. Two joysticks required.

Kevin Dixon

The year is 2529 and a lot has changed since the twentieth century. Space travel has become commonplace. People go to work daily on the moon and on several nearby planets. In keeping with their new environments, humans are continually seeking new forms of entertainment and games.

A highly popular game has emerged in recent years. In this new contest of skill, you fight a battle of survival against an equally matched opponent. Only one of you can emerge victorious—you give no quarter and ask none in return.

You and your opponent choose between an open battlefield and a randomly generated maze. When you've chosen your arena, you go into the locker room to don your battle armor and gather your weapons. The weapon of choice for this contest is a newly developed, remote-control boomerang. The unique feature of this weapon is that after throwing it, you can guide it to its target. If you hit your opponent, his suit of armor shorts out, sending him back to the locker room for another.

High-speed flying boomerangs echo your motions as you try to hit your opponent while remaining unscathed.

Typing It In

"Boomerang" is written in machine language, so you must use "MLX," the machine language entry program found elsewhere in this issue, to enter it. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1BC0

When you've finished entering the data for Boomerang, be sure to save a copy of it to tape or disk.

Even though the program is written entirely in machine language, it is designed to be loaded and run just like a BASIC program. To play, plug in two joysticks, type

```
LOAD"BOOMERANG",8
```

and then type RUN.

Boomerang's opening screen asks you to select the game speed. Push either joystick up or down to select a speed and then press the fire button. Speed 1 is the slowest and speed 3 is the fastest. Next, you're asked whether you'd like a maze. Again, push either joystick up or down—to answer Yes or No—and then press the fire button.

If you request a maze as your arena, the computer generates a random maze and asks each player to approve it. Push the joystick up or down to select Yes or No; then press the fire button. If either contestant selects No, the computer generates another maze and asks again. Both players must approve the maze before the contest begins.

Into the Arena

As you enter the battlefield, the blue player begins on the left side of the screen; the red player, on the right. Lying on the ground nearby is your boomerang. Your boomer-

ang is the color of your armor. You can pick it up by touching it. Touching your opponent's boomerang shorts out your suit of armor.

Move about the arena by pressing the joystick in the direction you wish to go. To throw your boomerang, press the fire button. The boomerang flies in the direction you were last facing.

To change the direction of your boomerang in midflight, press your fire button. Its direction will change to the direction you are currently facing. With careful maneuvering, you can guide the boomerang back to where you can catch it.

Be careful not to let your boomerang get out of range. If it is more than about two-thirds of the screen's width away from you, you lose control of it. If you lose control, the boomerang continues flying in its current direction until it hits either your opponent or a wall. You can pick up your boomerang by touching it again.

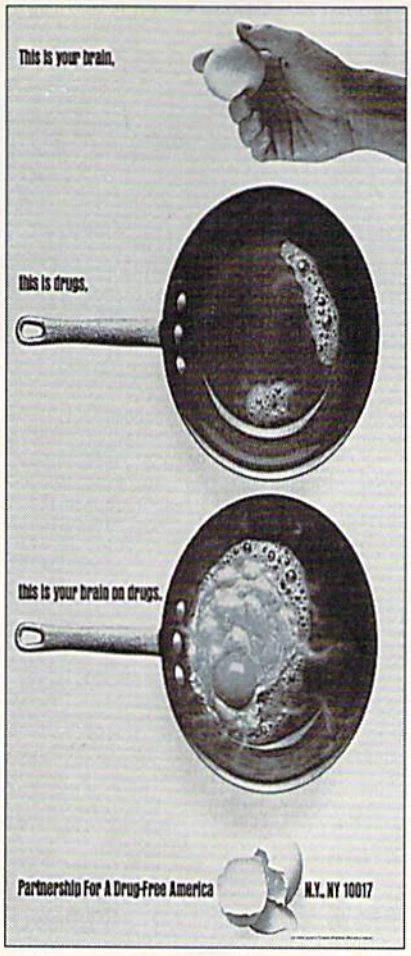
You can short your opponent's armor by hitting him with your boomerang. Don't think that just because a boomerang is stopped, it isn't deadly. Touching the opponent's boomerang at any time will short out either player's suit of armor. When one suit is shorted out, both contestants return to the locker room to prepare for the next round. The contest continues until a player has lost ten suits of armor. The player with one or more working suits of armor wins.

Once a winner has been found, you can elect to play again or return to BASIC. You can pause the game at any time by pressing the RUN/STOP key. Press RUN/STOP again to continue. You can quit the current game by pressing Q.

Strategy Tips

Try to find a long, winding tunnel to hide in. This makes it harder for your opponent to guide his boomerang toward you. If your opponent's boomerang hits a wall, try to keep him away from it by guarding it. This strategy allows you to take pot shots at your opponent when he comes in close to retrieve his boomerang. Remember that if you touch your opponent's boomerang, you'll be zapped. Also, don't let your boomerang get too far away or you may find yourself on the run.

See program listing on page 73. **G**



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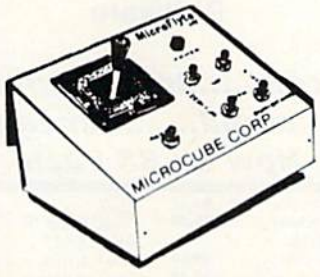

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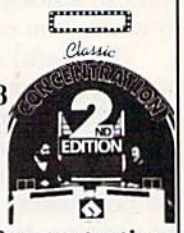

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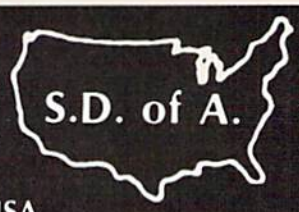

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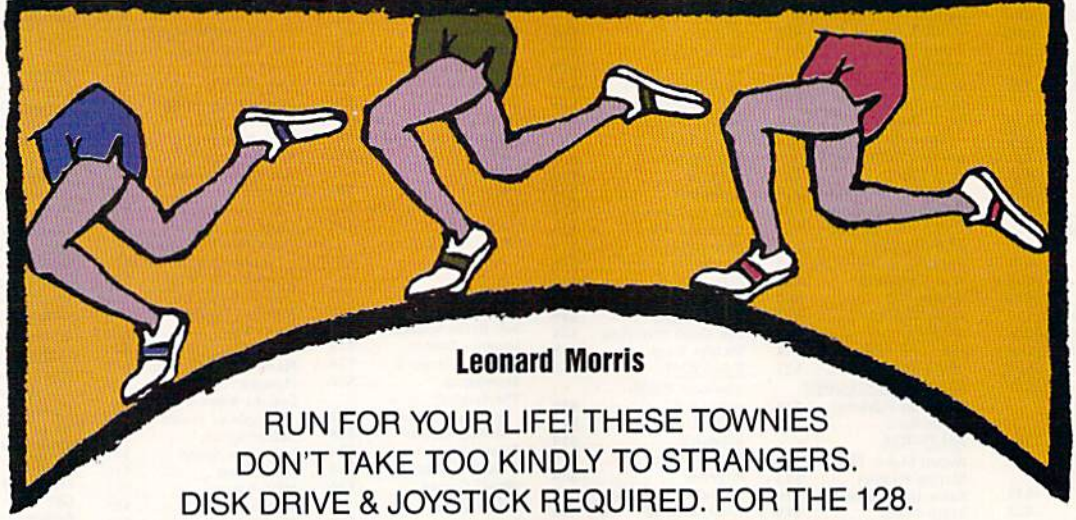

Leonard Morris

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You've been training for years to run your best race ever. In "Marathon," an arcade-style game for the Commodore 128, you get the opportunity. Unfortunately, the 26-mile course takes you through the town of Walkerville, where the mayor has recently outlawed running. The town folks agree and are out to enforce the mayor's decree. But first, they've got to catch you.

Getting Started

Marathon is written in BASIC 7.0 and machine language. Be sure that you're in 128 mode when you type in the programs. To prevent typing errors, enter Program 1, "Marathon BASIC," using "The Automatic Proofreader," found elsewhere in this issue. Be sure to save Program 1 to disk when you're finished typing it in. Because Program 2, "Marathon ML," is written in machine language, you'll need to enter it using the 128 version of "MLX," found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: 1300
Ending address: 1727

Before exiting MLX, be sure to save the program to disk as MARATHON ML.

To start the game, plug a joystick into port 2. Then load and run Program 1. (Program 1 will automatically load Program 2.)

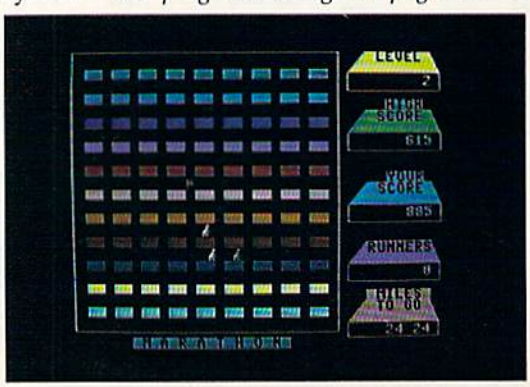
The object of the game is to avoid the Townies and complete a 26-mile marathon course. The course is a grid of city streets. You are the light red runner; the pursuing Townies are white. To move your runner, just push the joystick in the direction you want him to run (up, down, left, or right). If you are caught by any of the townsfolk, you lose a man. When you lose three men, the game is over.

Should you find yourself hopelessly cornered, press the fire button. The Townies will disappear long enough for you to escape. However, you can resort to this tactic only once per level or per man.

You score points by picking up flags that appear randomly on the course. Scoring starts with 15 points per flag and increases by this amount for each level. You get 30 points for a captured flag on the second level, 45 on the third level, and so on.

On the right side of the screen, you'll find your score, the high score, the current level number, and the number of men you have left. If you can outrun the Townies, you'll be awarded an extra man after every fourth level.

See program listings on page 81. **G**



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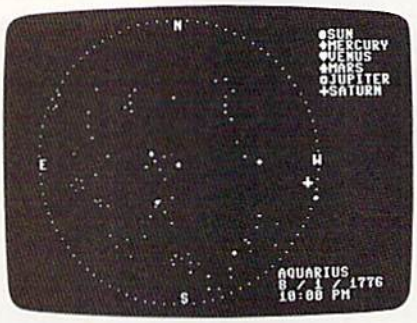
STARS II

Robert A. Mulford

EDITOR'S CHOICE

This outstanding program is your own personal planetarium, showing you when and where to look for planets and other celestial wonders. One of the finest sky simulations available for the Commodore 64.



Bring the night sky to your 64 with this accurate celestial simulation.

Since ancient times, man has gazed upward and wondered about the points of light in the night sky. Astrologers tried to attach meaning to the motion of the lights, using them to predict the future. Today, thanks to pioneers like Galileo, Ptolemy, and Copernicus, we have a clearer understanding of the motions of the heavenly bodies. With our increased knowledge, the night sky is even more fascinating than before.

"Stars II" brings the fascination of the stars and planets to your Commodore 64 or 128. Based on "Stars," published in the October 1987 *Gazette*, Stars II is even more powerful. With it, you can learn the constellations, identify and study the movements of the wandering planets, and view the sky for any date and time from any point on Earth.

Have you ever seen the planet Mercury? Jupiter? The constellation Aries? Stars II will show you when and where to look for visible planets, stars, and constellations. If you're curious about what the sky looks like from Australia or the North Pole, Stars II lets you travel there to observe. Stars II even shows the daytime sky, with the sun positioned in front of the normally invisible stars.

Getting Started

Stars II is written in BASIC with machine language routines stored in DATA statements. To ensure accuracy, you should use "The Automatic Proofreader," found elsewhere in this issue, to type it in. Be sure to save a copy to disk after you've finished typing.

When the program is first run, there is a short delay while Stars II POKEs its machine language routines into memory. Once the routines are in place, Stars II requests the year, month, day, hour, and minute of the sky you wish to view. Type the complete year, as in 1989. Enter the month as a number from 1 to 12. For example, type a 7 for July. Type the day as a number from 1 to 31, the hour as a number from 0 to 12, and the minute as a number from 0 to 59.

Stars II next asks whether the time is a.m. or p.m. Type A for a.m., or P for p.m. If the month is between April and October, Stars II asks whether the time is standard or daylight saving. Type S for standard time, or D for daylight saving. After the date and time have been entered, the menu appears on the screen. Using the menu, you can select your viewing angle, view the sky from any place on Earth, or get a summary of information about stars or planets. To select a menu item, press the number corresponding to the item.

Selecting Your View

Four different views of the sky can be selected. Option 1 is an overhead view showing the entire sky. Stars II uses a sophisticated technique, called *stereographic projection*, to project the entire sky onto a flat circular map with minimum distortion of the star patterns. The

outer circle of this map represents the horizon, while the center is the zenith (the point directly overhead in the sky). This option is especially useful for determining which constellations or planets are visible on a given night.

To concentrate on a particular area of the sky, select option 2, 3, or 4. Option 2 shows the eastern sky, option 3 shows the southern sky, and option 4 shows the western sky. When one of these options is selected, a portion of the sky is reproduced on the screen with the horizon at the bottom, similar to what you would see if you went outside and looked in that direction.

Stars are represented by white dots on a dark background. If it is night, the sky background is black. If the sun is near or above the horizon, the background changes to blue. Brighter stars appear as larger white dots on the display. Stars II accurately computes the positions of visible planets and marks them with distinctive symbols. Each planet, constellation, or star is named as it is plotted on the sky, allowing you to become familiar with the major star patterns. If an object is below the horizon, its name appears briefly, but the object does not appear onscreen.

Exploring the Heavens

Option 5, Solar System Data, summarizes information about the sun and visible planets for the date you've selected. Stars II solves Kepler's equation to compute extremely accurate positions for each planet. The altitude above (or below) the horizon and the direction in which each planet is visible are displayed. If the altitude is negative, the object is below the horizon. In addition, the distance of the sun and planets from the Earth is also shown. The sidereal time, or star time, is also displayed. (Sidereal time is most useful for experienced stargazers; it tells you which stars are directly overhead.)

Choose option 6 to change the date and time. As when first run, Stars II asks you to enter the year, month, day, hour, and minute. Although the program has no limitation on the date that can be entered, it is most accurate for years within 400 years of the present.

The default longitude and latitude of your viewing location are 75 degrees west, 40 degrees north. Option 7, Travel, lets you view the heavens from a different location on the Earth. If you elect to travel, Stars II first asks for the latitude. You can find the latitude of your destination on a good map; type it in to the nearest degree. Stars II next asks whether you wish to change longitude. Press Y to change it, or N to keep the old longitude. If you press N, Stars II assumes you are near the center of the default time zone. If you type Y, you can enter the exact longitude and time zone. The time zone value is the difference, in hours, between local standard time and the time at zero longitude in England. For Eastern standard time (EST) enter 5, for Central standard time (CST) enter 6, and so on. West longitudes and time zones are positive. The time zone is not affected if you request daylight saving time, because Stars II makes all the necessary adjustments.

It is easy to change the default values for latitude, longitude, and time zone to your home's location. To do this, load Stars II and change the values of LT, LG, and TZ (latitude, longitude, and time zone) in line 50. Make sure you save the customized program using a new name.

Additional Options

Select option 8 to list all the constellations visible in Stars II, with a brief description of each. There are many constellations in the sky, but most of them are faint. Stars II does not attempt to display them all. All the bright and important star patterns are here, however, including the 12 constellations of the zodiac. Learn these constellations and you'll have no trouble finding your way around the real sky.

Option 9 toggles simulation mode on or off. Press 9 to turn on the simulation; then select a view from one of the first four options. Stars II completes the sky display for your selected date and then computes and displays the sky at the same time on successive months. This allows you to watch how the constellations change with the seasons or to watch the wanderings of the planets as the year goes by. Press the S key to stop the simulation and return to the menu. Press Q to quit the program and return to BASIC.

See program listing on page 75. **G**

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Screen Splitter

Ruben L. Pakman

Harness the power of raster interrupts to create spectacular screens with this utility for the 64.

With "Screen Splitter," you can design rainbow screen borders, command dozens of sprites, and display hi-res graphics with text. This easy-to-use BASIC program gives you the power of raster interrupts without having to learn machine language. You can integrate Screen Splitter's powerful routines into your own programs for dazzling displays.

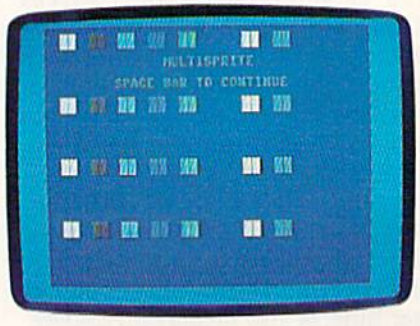
Getting Started

Program 1, Screen Splitter, is written entirely in BASIC, so be sure to use "The Automatic Proofreader," found elsewhere in this issue, to minimize typing errors. Be sure to save the program before running it. There are also listings for three interrupt routines and a BASIC demo program, but you don't have to type them in to use the main program.

Screen Splitter's main menu has five options. To see how the program works, create an interrupt that changes the background and border. Choose f1, create interrupt. Next, enter the number of horizontal screen areas. The minimum is 2 and the maximum is 100. Enter 3 this time. Now, cursor up and down to set the boundaries of each area. Be sure each zone is at least two lines high. Press RETURN to define the next area. Press E to abort and exit to the main menu. Screen Splitter displays all the zones and asks for confirmation.

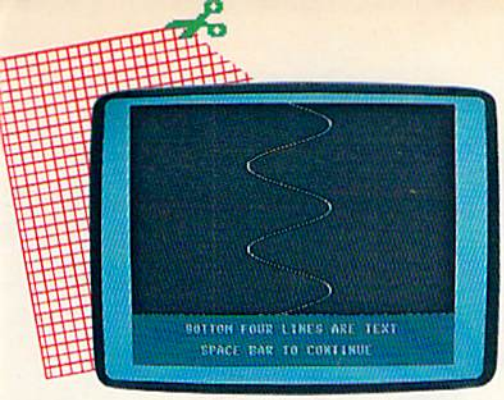
After you've set up the areas, decide which memory locations you would like to change during the raster interrupt. Possibilities include the screen colors, the sprite registers, and the display mode. The addresses of these registers can be found in technical and programming manuals for the 64.

The program prompts you to enter the number of addresses to affect. Screen Splitter allows you to change as many locations as you like, but enter 2 for this example. Next, enter 53281 for address 1 to alter the background color. Set the value (in this case, a color number in the range 0–15) for each area. Each area should have a different color. After entering all the values for address 1, the program displays the entries and asks for confirmation. Enter *Y* to proceed, *N* to go back and change something, or *E* to exit to the main menu.



Break the 8-sprite limit with "Screen Splitter." This photo is from the demo program.

Now enter 53280 to change address 2, the border color. Repeat the process of entering values and confirmation. Finally, the program asks you if there is another interrupt. Enter *Y* if you're using any special interrupt-driven utilities; otherwise enter *N*. Screen Splitter creates the raster interrupt routine and puts it into memory at 49170.



"Screen Splitter" lets you display hi-res graphics and text on the same screen.

Press any key to return to the main menu; then press f3 to display the interrupt created. A screen with a split background and border should be displayed. Press f4 to turn off the interrupt. Press f5 to save this interrupt to disk. Press f1 to create another interrupt. Press f7 to exit to BASIC. You can't edit a routine; you must recreate it from scratch each time.

Demos

Programs 2, 3, and 4 are interrupt routines created with Screen Splitter. Use MLX to enter them. Save each file before typing in the next one. Be sure to use the filenames indicated because Program 5 loads them in. When MLX prompts you, respond with the values below.

Program 2, "RainbowBorder"

Starting address: C010
Ending address: C097

Program 3, "MultiSprite"

Starting address: C010
Ending address: C0B7

Program 4, "TextHires"

Starting address: C010
Ending address: C06F

Program 2 can be run from direct mode. Type in the following sequence to see it:

```
LOAD "RAINBOWBORDER",8,1
NEW
SYS49170
```

Press RUN/STOP–RESTORE to deactivate one interrupt routine before loading another.

To see MultiSprite and TextHires in action, type in Program 5, Demo, using The Automatic Proofreader. This BASIC program loads and demonstrates all three ML routines. Demo POKEs in the code to disable the raster interrupt and return the screen to normal. A SYS 52376 before each load makes sure no interrupt is active.

RainbowBorder is the simplest example. It changes one address (53280) and has 25 screen areas.

MultiSprite changes the eight vertical sprite-position locations (53249, 53251, 53253, 53255, 53257, 53259, 53261, 53263) and has four screen areas. The screen areas cover raster lines 51–98, 99–146, 147–194, and 195–bottom. The values for each sprite memory location are 55, 104, 154, 204. When working with sprites, you get better results if you allow some space between the raster and the sprite. For instance, the second screen area starts at raster line 99, but the sprites are displayed at line 104. There is no provision for moving the sprites independently.

TextHires has two areas and alters locations 53272 (values 29, 21) and 53265 (values 59, 27). The top of the screen displays a cyan sine wave on a black background in hires mode, with a text window at the bottom of the screen.

See program listings on page 84. **G**

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QUIZ MAKER

Jim Wilday

Here's an easy way to generate and administer multiple-choice quizzes—it's ideal for home or school use. For the Commodore 128, 64, and Plus/4. A disk drive is required.

A popular form of testing is the multiple-choice quiz. "Quiz Maker" lets parents and teachers create and administer multiple-choice tests on any subject and at any skill level. The program runs on the 128, the 64, and the Plus/4. Once a test is set up, the only input required of the student is to match the correct answers.

Getting Started

Quiz Maker is written entirely in BASIC. To prevent typing mistakes, be sure to use "The Automatic Proofreader," found elsewhere in this issue, when entering the program. Save the program to disk before you attempt to run it.

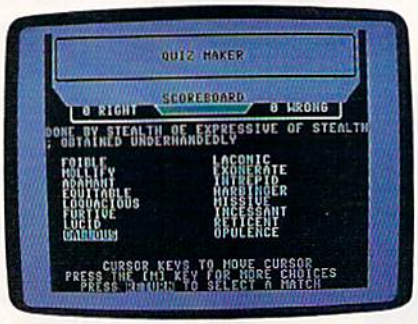
When you're ready to create or take a quiz, load the program, type RUN, and press RETURN. A menu screen will appear with four options: Add data (+), Erase all data (−), Save this version (S), and Play (any other key).

Currently, the program is set up for a vocabulary quiz. The DATA statements at the end of the listing contain some words and their definitions. The data value in line 1000 indicates how many words have been defined.

To take the sample quiz, choose the play option from the menu. A scoreboard will appear at the top of the screen, followed by a randomly selected word definition, a list of 16 vocabulary words, and play instructions.

Locate the word in the list that corresponds to the definition. If you can't find a match, press M for more words. When you've found what you think is the correct word, use the cursor keys to position the highlight bar over it and press RETURN.

If you've made the right choice, another definition appears. Otherwise, the program displays the definition along with the correct word. To continue the quiz at this point, just press a key. After you've completed the quiz, your score is reported as a percentage.



Match the definition with the correct word. A sample quiz is provided, and it's easy to create your own.

Creating a Quiz

Quiz Maker allows you to make individual multiple-choice quizzes for children based on their skill levels. You can set up any type of quiz, limited only by the length of the input.

To create a quiz, first choose the erase-data option from the menu. The program will delete all test material in the DATA statements at the end of the listing. (Be patient—this may take some time, especially if there's a lot of data.) Afterward, you're returned to the menu.

Next, select the add-data option. The program prompts you for a "word" or term that is no more than 18 characters, followed by a matching "sentence" that is less than 70 characters in length.

Since the program uses a custom input routine, you can enter any character from the keyboard at each prompt. So, if you're writing a math quiz, you can substitute the solution to a math problem for the word, and a formula for the sentence. By entering dates and events at the prompts, you can lay out a history quiz in a similar manner.

To edit an entry as you're typing it in, use CLR/HOME (to erase the entire entry) or DEL (to remove individual characters from right to left). Cursoring within the input field isn't allowed. Once you've finished entering a word or sentence, press RETURN. After the sentence is entered, the program automatically updates the word count in line 1000, adds the data to the end of the program, and returns you to the menu.

When you've finished constructing a quiz, press S to save it to disk. You'll then be prompted for a filename. To help you keep track of the quizzes on disk, name each quiz after the student or subject you're testing.

While using the program, be careful not to press the − key from the menu unless you're certain you want to erase the quiz data. The program won't ask twice—it immediately starts deleting DATA lines. Should this happen, quickly press RUN/STOP–RESTORE. You may have to reenter some quiz data, but the bulk of it should remain intact. When you've reentered the deleted portion, be sure to update the word count in line 1000 and save the quiz to disk.

See program listing on page 79. **G**

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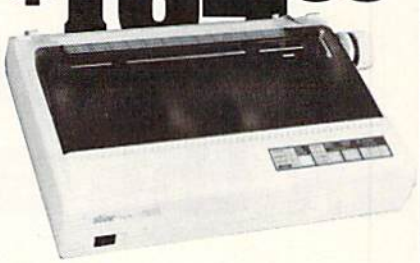

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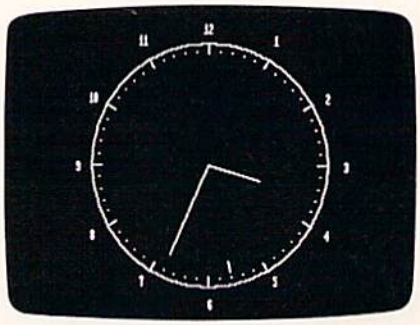
G5C

VDC Graphics

Bitmapped Graphics on the 80-Column Screen

Nine new commands for BASIC 7.0 let you control the 128's 80-column screen for bitmapped graphics. Three impressive demo programs are included.

Ken Davies



Use BASIC 7.0 commands to draw on the 80-column hi-res screen. This animated clock keeps accurate time by tracking the system clock (from the Program 2 demo).

The Commodore 128 has two display modes: 40 and 80 columns. The VIC-II chip, which generates the 40-column screen, can display text, bitmapped graphics, and sprites (graphic objects that are separate from the rest of the screen). The VIC-II can also display combinations of text and bitmapped graphics by using raster interrupts. These combination screens are usually called *split screens*. Although it doesn't support sprites or split screens, the VDC chip which generates the 80-column display is generally more powerful than the VIC-II. Not only does the VDC generate a sharper, clearer display than the VIC-II, but it also can generate displays with more resolution (640 × 200 and 640 × 400, compared to the 40-column screen's 320 × 200) and more colors.

Standard 128s don't have enough video memory to support the VDC's highest resolution, but there is enough memory to display a 640 × 200 monochrome screen. (128Ds have more video memory and can display the 640 × 400 screen.) 128 owners with 80-column monitors can display screens with twice the pixel resolution of the 40-column screen; 128D owners can display screens with four times the pixel resolution.

BASIC 7.0 (the version of BASIC in the 128) has a versatile set of graphics statements that work very well in 40 columns but don't support the 80-column screen. "VDC Graphics" is a machine language program that adds nine new commands to BASIC 7.0. The new commands are similar to the standard 40-column graphics commands, so translating older graphics programs to use the 80-column screen is easy.

Getting Started

VDC Graphics is written in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue, when entering it. When you run MLX, you're prompted for starting and ending addresses of the program you're entering. The MLX prompts, and the values you should type in for VDC Graphics, are as follows:

Starting address: 1300
Ending address: 1B7F

Once you've finished entering the program, be sure to save a copy to tape or disk before exiting MLX. Save the program using the filename VDC GRAPHICS. You can install the program by typing BLOAD"VDC Graphics" and then SYS 4864. You must install VDC Graphics before typing in Programs 2–4. If you enter the demo programs without Program 1 installed, the new keywords won't be tokenized properly.

To see some examples of what you can do with VDC Graphics, type in Programs 2–4. Program 2, "Clock Demo," displays a full-size analog clock on the 80-column bitmapped screen. Program 3, "Paint Thinner," is a short but interesting line-drawing and flood-fill demo. Program 4, "Worm Demo," is an example of simple 80-column bitmap animation.

BASIC Statements

With only a few exceptions, VDC Graphics uses the same keywords and syntax used by the standard BASIC 7.0 graphics commands. You must insert the keyword CALL in front of graphics statements intended for the 80-column screen. The commands BOX, GSHAPE, and SSHAPE aren't implemented in VDC Graphics.

VDC Graphics provides a special pixel-flip mode, which can be activated by typing SYS 4924,1. When pixel-flip mode is activated, you reverse the state of the pixels (on pixels are turned off, and off pixels are turned on) when you draw to the hi-res screen, thus performing an exclusive OR with the graphics. SYS 4924,0 returns to the normal plot mode.

The following list shows the syntax for all of VDC Graphics' commands, with a brief description of how they're used. Command names are shown in uppercase. Any arguments are shown in lowercase, italic type. Optional arguments are surrounded by brackets. Legal values for the command arguments are given below the command name.

CALL GRAPHIC *mode*

mode	0 = Sets VDC screen to text mode 1 = Sets VDC to high-resolution mode

Sets the graphics mode for the 80-column screen. If the 80-column screen is active when the GRAPHIC command is executed, VDC Graphics automatically makes the 40-column screen the active text screen. VDC Graphics always clears the VDC screen when the GRAPHIC command is called. The VDC doesn't support split screens, so any attempt to create a split screen with the GRAPHIC command causes a syntax error.

CALL PAINT *[color source],x,y*

color source	0 = Paints in background color 1 = Paints in foreground color
x,y	Starting coordinates of fill (0,0–639,199)

Begins a flood fill in the specified color at coordinates *(x,y)*.

CALL CHAR *[color source],x,y [,string][,rvs]*

color source	Ignored by VDC Graphics
x	Character column (0–79)
y	Character row (0–24)
string	String to be displayed
rvs	Reverse field flag (0 = off, 1 = on)

Prints a character string on the 80-column bitmapped screen at coordinates *(x,y)*. VDC Graphics ignores the *color source* parameter; it's included for compatibility with the BASIC 7.0 CHAR statement.

CALL CIRCLE *[color source],x,y[,xr] [,yr][,sa][,ea][,angle][,inc]*

color source	0 = Draws in bitmap background color 1 = Draws in bitmap foreground color
x,y	Coordinates of the center of the circle
xr	*x* radius (scaled); (default = 0)
yr	*y* radius (scaled); (default = *xr*)
sa	Starting arc angle (default = 0 degrees)
ea	Ending arc angle (default = 360 degrees)
angle	Rotation in clockwise degrees (default = 0 degrees)
inc	Degrees between segments (default = 2 degrees)

Draws a circle, an ellipse, or an arc. For determining starting and ending angles, 0 degrees is located at the top of the circle and increasing angles proceed around to the right so that 90 degrees is on the right, 180 degrees is on the bottom, and 270 degrees is on the left.

CALL DRAW *[color source][,x1 ,y1 . . .][***TO** *x2,y2 . . .]*

color source	0 = Draws in bitmap background 1 = Draws in bitmap foreground
x1,y1	Starting coordinates of the line (0,0–639,199)
x2,y2	Ending coordinates of the line (0,0–639,199)

The DRAW command is very flexible. It can be used to plot points or draw lines using absolute rectangular coordinates or relative rectangular or polar coordinates. Some examples of valid DRAW commands are

CALL DRAW
CALL DRAW *color*
CALL DRAW *color,x1,y1,x2,y2, . . .*
CALL DRAW *color,x1,y1* **TO** *x2,y2* **TO** *x3,y3* **TO . . .**
CALL DRAW TO *x2,y2*

The *(x,y)* coordinate pairs can be replaced by polar coordinates in the form *radius;angle*, where *radius* is the pixel distance from the current pixel location and *angle* is the relative angle (0 degrees is to the right of the current pixel; 90 degrees is above). VDC Graphics suffers from the same bug that plagues BASIC 7.0: Negative values for coordinates result in an ILLEGAL QUANTITY ERROR. It's possible to avoid this bug by poking twos complement integers into the pixel-cursor-position registers. Locations 4401–4402 contain the *x* position and locations 4403–4404 contain the *y* position.

CALL LOCATE *x,y*

x,y	Coordinates to move the pixel cursor to (0,0–639,199)

Moves the pixel cursor to the position *(x,y)*. The *(x,y)* coordinate pair can be replaced by a polar coordinate pair in the form *radius;angle*, where *radius* is the pixel distance from the current pixel location and *angle* is the relative angle (0 degrees is to the right of the current pixel; 90 degrees is above).

CALL COLOR *source number,color value*

source number	0 = Sets bitmap background color 1 = Sets bitmap foreground color
color value	VDC color values (1–16)

Sets the foreground or background color of the bitmapped screen.

CALL SCNCLR

Clears the 80-column high-resolution screen.

CALL QUIT

Disables VDC Graphics' commands. If VDC Graphics isn't overwritten by another program, you can type SYS 4864 to reenable it.

Generic Commands

A few standard BASIC 7.0 graphics commands can be used with VDC Graphics. These commands don't directly operate on the 80-column bitmapped screen and so don't require CALL.

SCALE *n[,xmax,ymax]*

n	0 = Scaling off 1 = Scaling on
xmax	320 <= *xmax* <= 32767
ymax	200 <= *ymax* <= 32767

Scales the coordinates of the bitmap from 0 to 32767.

SCALE suffers from the same problem whether it's used with the 80-column bitmapped screen or with the VIC-II's multicolor bitmap screen. The SCALE command assumes the physical width of the bitmap is 320 pixels. This assumption causes the scale for the *x*-axis to be off by a factor of 2 for the 80-column bitmap and the VIC-II's multicolor bitmap. To scale the bitmap properly, divide the normal *xmax* value by 2.

WIDTH *n*

n	1 or 2

Defines the width of lines to be drawn.

RDOT *n*

n	0 = Returns the *x* coordinate of the pixel cursor 1 = Returns the *y* coordinate of the pixel cursor 2 = Doesn't work with VDC Graphics (see discussion below)

With 40-column bitmaps, setting *n* to 2 returns the status of the pixel at the pixel cursor. To return the status of a pixel found in the 80-column bitmap, set the pixel cursor to the desired coordinates (using LOCATE, for example), type SYS 4927, and then use RREG(*n*) to return the color source of the pixel in the variable *n*. If *n* = 0, the pixel is off; if *n* = 1, the pixel is on.

See program listings on page 82. **G**

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1541 RAMBOard*

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Let's face it - war is hell. And in the Commodore world, one of the ugliest wars of all is being waged by the copy protection industry. They're tough. They're clever. And they're very, very determined. If you've seen some of the current ice out there, you know just how determined they are. Well, we're just as determined. And we've got a way to walk right through the coldest ice out there.

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Get your RAMBOard today. And the next time some company tries to charge you for an "authorized" backup of a program you've already paid for, remind them that war IS hell - and you know how to raise a little hell of your own.

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THE 1581 TOOLKIT

Is This Utility Healthy? Get A Second Opinion.

Sure, we're going to tell you that The 1581 Toolkit is incredible. But how about a second opinion? "...ten first-rate 1581 utility programs..." "...added an exhaustive 147 page technical treatise on the internal workings of the 1581 and its DOS." "...all menu driven and quite easy to use, despite the fact that they are all quite powerful and flexible." "...dozens of little extras." "...a pleasure to use." "...significantly outperforms anything released to date..."

The words above are from a review of The 1581 Toolkit in the May/June 1989 issue of INFO Magazine. We received 4 1/2 out of a possible five stars, a very rare achievement for a 1.0 release of a new utility. And as for their expert opinion that The 1581 Toolkit is "...a must for any heavy 1581 user..." we couldn't agree more. Because the Toolkit givers you all this:

- ★ **Fast Disk Copier**
- ★ **Fast File Copier**
- ★ **Byte Pattern Search**
- ★ **Partition Creator**
- ★ **Ultrafast Formatter**
- ★ **Track and Sector Editor**
- ★ **Directory Editor**
- ★ **Error Scanner**
- ★ **Relocatable Fast Loader**
- ★ **File Track and Sector Tracer**

All 10 of these custom utilities use super fast read/write routines and, where appropriate, allow full access to partitions. We designed The 1581 Toolkit to be the finest set of utilities available for the 1581. But we didn't stop there. Included with the Toolkit is a FREE copy of David Martin's invaluable resource, *The 1581 DOS Reference Guide*. This book holds over 100 pages of information that took more than a year of research and investigation into the inner workings of the 1581 to compile. And we've also added exra utilities like a machine language monitor with DriveMon - the perfect companion to *The 1581 DOS Reference Guide*.

You may *own* a 1581 disk drive, but you're not really *using* your 1581 if you don't have The 1581 Toolkit. The Toolkit's strength lies in the fact that, unlike some companies, we took the time to master the 1581 before we began. The reason is simple: we don't care if this is the *first* utility you buy for your 1581 - we just want it to be the *last* one.

THE 1581 TOOLKIT (ON 3.5" DISK) IS ONLY $39.95

Includes Your FREE 1581 DOS Reference Guide

The 1581 Toolkit Works On The C-64 Or The C-128/C-128D In The 64 Mode

SYSRES

Your Last Chance To Own A Classic.

All good things must come to an end. That's true for everything, including software. The time has come to say goodbye to an old friend - SYSRES, the finest BASIC enchancement system ever created for th Commodore computer.

Software Support owns the exclusive rights to produce SYSRES. Reluctantly, we've decided to stop producing this incredible program. Why? The simple fact is that most of the serious BASIC programmers out there already own SYSRES, and there aren't enough new BASIC programmers entering the arena to warrant the expense of continued production of SYSRES.

If you're one of the few serious BASIC programmers out there who isn't yet using SYSRES, maybe you should take a look at some of these features:

- Easy code entry with features like auto line numbering, enhanced key repeat, and fast up and down scrolling of program listings!
- Macros: any shifted key may be set to represent any BASIC or SYSRES KEYWORD. All files may be listed, loaded, run, copied, or scratched by entering a two character command in front of the file name listed in the directory!
- Find/Change any variable phrase or keyword used anywhere in your program. Over 700 search variations are available including pattern matching with wild cards and limitation symbols. Now you can automatically remove spaces and REMS to streamline run-time versions of your programs!

List BASIC programs and relative and sequential files without loading them into memory first!

- Edit text files and assembler source code without having to leave BASIC!
- Do a partial renumber. Move a subroutine to a more logical starting place while preserving all other line numbers and updating all line references!
- Debug with a variable speed TRACE. Display the current and the five previous operations. Display variables as they change or are defined: send the TRACE to the printer!

We haven't even scratched the surface of SYSRES. With features like screen print, multiple drive support, full printer support, and program merge capabilities, it's easy to see why SYSRES is the most comprehensive BASIC programmers' aid package ever produced. And just as comprehensive is the professional documentation: over 110 pages, bound in an attractive three ring binder. You'll also be pleased to know that SYSRES is UNprotected!

So there you have it. If you use BASIC at all, this is the enhancement system that you need. And this is absolutely your last chance to own this classic. As a going away present, we've even cut the price in half! Now there's no reason for you to limp by on plain vanilla BASIC any more. Get SYSRES today - and get involved with some serious programming power!

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While Limited Supplies Last!

ALL NEW

THE 1750 CLONE

Thanks For The Memory

Most Commodore users are content to use their computers within the constraints placed on them by a limited amount of RAM. But some people want more. More speed. More power. And that means just one thing - more memory.

Power users have long known that the ideal solution to their memory problems is out there in the form of Commodore's incredible 1750 RAM expansion module. Just plug it in and you've got a whopping 512k of onboard RAM - the same amount of memory found on most IBM computers! This is the memory cartridge that all serious Commodore power users want. There's only one problem.

You can't find them.

That's right. These RAM units are almost impossible to buy. We've always specialized in finding solutions to Commodore related problems - here's what we came up with.

First, we bought brand new Commodore 1764 RAM expansion units, the ones with only 256k of RAM onboard. Next, we had Chip Level Design engineer and produce a custom upgrade that takes a 1764 to a full 512k! That's the same half meg of RAM as a regular 1750! Finally, we tested each and every cartridge, and warranteed them to be free from defects.

Now there's nothing to stop you from taking your Commodore 64 or 128 to levels of power and sophistication that the original designers never even dreamed of! If you're using programs like GEOS from Berkeley; the Pocket Series from Digital Soutions; future versions of Maverick from Kracker Jax; Fleet System IV from Professional Software; or the potent PaperClip III from Batteries Included; if you're using ANY of these programs, you won't believe the difference that the extra memory makes!

IMPORTANT NOTES - READ CAREFULLY

*C-64 64c (but NOT C-128 128D) owners MUST buy a heavy-duty power supply to use these units. The power supply is NOT included - it is available from us seperately.

* If you ALREADY own a 1764 RAM cartridge, we can upgrade it for you. Your unit MUST be in perfect working order for us to upgrade it. The turnaround time on upgrades is approx. 2 weeks. It will NOT be necessary for you to purchase a new power supply - the one that came with your 1764 will still work fine.

THE 1750 CLONE

ONLY $199.95

1764 UPGRADE

ONLY $124.95

ATTENTION C-128 OWNERS

Solderless 64K Video RAM Upgrade

Now that Commodore has released the C-128D with 64K of video RAM, we should be seeing 128 programs address this fantastic new feature soon.

BASIC 8 already has the capability of using all 64K of video RAM. If you own the C-128 in stock condition, you own all 16K of video RAM that Commodore felt was necessary. Using Basic 8 format and the full 64K of video RAM provides you with the ability to scroll through video memory as well as enhanced color resolution.

Up until now, to upgrade the C-128 to 64K of video RAM you would have to first search out the components, then find a competent repair outlet to desolder and install the parts. **What a hassle!**

SOLUTION — We have developed a module that simply plugs in to the mother board of your C-128. **No splattered solder — No heat damage — No hassle.**

This package is available in two different forms. Model A has all parts necessary to complete your upgrade, and Model B is identical except that you supply the RAMs. Again, no soldering is necessary. If you have access to low cost RAMs, we suggest Model B.

Both models include easy to follow installation instructions, a test program to verify proper installation, and the plug in Video RAM Upgrade.

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This doesn't have to happen to you. We are now selling a heavy-duty power supply that will greatly diminish your fear of a power supply failure. These are NOT aftermarket units - they are made by Commodore, and are ideal for use with RAM expanders. They will provide you with a more stable, dependable source of power. This unit will work on ALL C-64's and 64c's on the market.

If your system is important to you, take the extra step to safeguard your investment by getting a Commodore Heavy-Duty Power Supply today. Power you can depend on - with no unexpected shocks.

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SPRITE CLOCK

Keith M. Groce

Ever been so involved in programming that you forgot the time? If so, this program can help. It displays a realtime clock that runs even while you program. For the Commodore 64.

A number of interrupt-driven clock routines have been written for the 64 over the years. Unfortunately, many of these share a common problem: If you happen to press RETURN over the clock display, they become part of your program. "Sprite Clock" eliminates this problem by using a pair of sprites to display the time. Thus, the clock is no longer visible to the screen editor.

Sprite Clock prints the current time in oversized numerals at the bottom of the screen. It won't interfere with your programming, and it's easy to set up.

Getting Started

Sprite Clock is a machine language program in the form of a BASIC loader. To avoid typing mistakes when you enter the program, use "The Automatic Proofreader," found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to tape or disk.

To install the clock, load the program and type RUN. The loader will POKE the machine language routines into memory and then prompt you for the current time. Enter the hour, minutes, and either *A* or *P* (for AM or PM); separate each by a comma. For example, if it's 10:05 AM, you enter *10,5,A*.

Once you've initialized the clock, you can use your computer normally. With the exception of certain IRQ interrupt-driven routines, Sprite Clock is compatible with most programs.

Altering the Display

The clock appears in the lower right corner of the screen. Sprites 6 and 7 are used for the display; if you wish to change the clock's location, color, or size, initialize it and then POKE the appropriate sprite-control registers.

For instance, to reposition the clock near the top of the screen (on sprite-coordinate line 52), enter

```
POKE 53261,52:POKE 53263,52
```

(If you want to change the clock's location permanently, change the value 234 in line 400 to 52 and the checksum 37842 in line 130 to 37660.)

The color of the clock is taken from the current cursor color and is determined the moment you initialize the clock. To set the clock color, change the color of the cursor just before you enter the time. To do this, hold down the CTRL or Commodore key and press a number key in the range 1–9. (If you need to change the clock color after the clock has started , POKE the color registers for sprite 6 and 7 at locations 53293 and 53294, respectively, with a color value in the range 0–15.)

At some point while you're programming, the clock display may begin to annoy you. If so, you can clear it from the screen by pressing RUN/STOP–RESTORE. To bring it back up (at its default location), type SYS 1007 and press RETURN. (You can also change the clock's color by changing the cursor color prior to this SYS call.)

How It Works

The program consists of two separate routines: a driver routine, located in the cassette buffer along with the sprite definitions, and the clock display routine, located in the RAM under BASIC ROM. Zero page and the 4K of free RAM at 49152 remain undisturbed.

Once you've entered the current time, the program initializes the sprite parameters, sets the TOD clock at 56328, and redirects the IRQ interrupt vector to the driver routine. The driver routine checks the minutes setting. If a minute has elapsed, the program redefines the sprites based on the updated clock setting. Otherwise, it leaves the clock display unchanged.

See program listing on page 86. **G**

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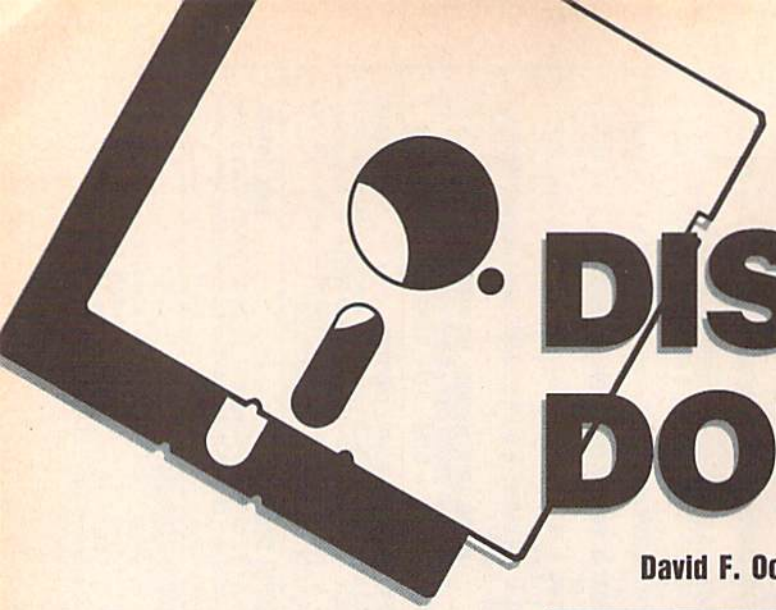


EDITOR'S CHOICE

DISK DOUBLER

David F. Ockrassa

Get twice the storage space from your single-sided disks without having to type cryptic commands or flip your disks over. For the 64 or 128 with a 1571 disk drive.

The 1571 disk drive is one of the most versatile drives available for any computer. It is capable of reading and writing a variety of different disk formats, both single- and double-sided, from Commodore to MS-DOS to CP/M.

Many new 1571 owners think, "Great! I'll have twice as much room for my word processor and database files." What they may not realize is that to use the extra space afforded them by the new drive, they'll have to format a new disk for double-sided use and transfer the files individually. If only there were a way to format the second side of the disk.

Several 1571 users have tried to use the following command sequence to format the second side of their single-sided disks:

```
OPEN15,8,15,"U0>M0" (make the drive
  single-sided)
PRINT#15,"U0>H1" (select side 2)
PRINT#15,"N0:diskname, id" (format
  side 2)
CLOSE15
```

Unfortunately, this sequence of commands produces a disk that has the equivalent of another single-sided disk on side 2. A slick trick, but one which requires a sequence of commands similar to the ones above in order for you to be able to use side 2.

Through special programming, "Disk Doubler" converts 1541 and 1571 single-sided disks into true double-sided disks. It allows you to use the extra storage capacity on side 2 without having to manually copy the files to a new disk or send a cryptic string of commands to the drive.

Typing It In

Disk Doubler is written in BASIC, so be sure to use "The Automatic Proofreader," found elsewhere in this issue, to prevent typing errors while you enter it. Save a copy of the program to disk when you've finished entering it. Disk Doubler modifies your disk directly; use it only on unimportant disks until you're sure it works correctly. A good way to test the program is to format a new disk for single-sided use and then run Disk Doubler. If you no longer have a 1541, you can make your 1571 format disks for single-sided use by putting it in 1541 mode before formatting the disk. Use the command **OPEN 15,8,15,"U0>M0":CLOSE15** to put your 1571 into 1541 mode. The command **OPEN15,8,15,"U0>M1 ":CLOSE15** returns it to 1571 mode. If you look at the disk directory after you've formatted it, it should have 664 blocks free. After you've run Disk Doubler, it should have 1328 blocks free.

Disk Doubler runs on either the 64 or the 128. If you are a 128 user, you can use either the 40- or the 80-column monitor. To get started, simply load the program and type RUN.

Disk Doubler first checks to see whether the disk is already double-sided. If so, it informs you and then gives you the option of formatting another disk. If the disk isn't double-sided, it begins formatting the second side. Do not use Disk Doubler on flippies (disks that have been flipped over and formatted on the second side). There is no way for Disk Doubler to detect whether the second side is already formatted. If Disk Doubler is used on a flippy, all data on the second side will be lost.

Disk Doubler tells you what is happening as it works. When the work is complete, it asks whether you want to modify another disk.

How It Works

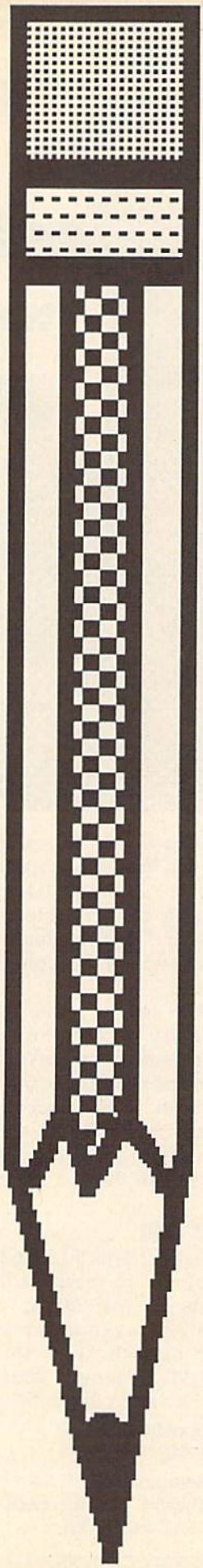
Formatting side 2 of a single-sided disk requires only a single command, but because of differences in the BAM (Block Availability Map) on single- and double-sided disks, this reformatting is only part of the job. Changes must be made to the BAM on side 1, and the BAM on side 2 must be built.

The BAM for side 1 is found on track 18, sector 0. Byte 3 of this sector is a flag telling the drive whether the disk is single- or double-sided. This flag must be changed so that the drive will know to use the second side. Also, bytes 221 through 255 must be modified for the system to properly recognize side 2. The BAM for side 2 must be filled in to let the drive know the tracks on that side are empty.

See program listing on page 85. **G**

NOTEPAD 128

E. D. Franz



"Notepad 64" (November 1988) lets you store notes in the 64's memory or on disk with the touch of a key. Here's a version of this popular program for the 128.

If you're a "Notepad 64" user and have longed for a 128 version of this handy program, you're in luck. Now there's "Notepad 128"—identical in form and function to the 64 version. Like its sibling, this program serves as a computer scratch pad. Anytime you need to jot down a note or recall an important memo, Notepad 128 is within easy reach. Best of all, it's transparent to BASIC.

Typing It In

Notepad 128 is written entirely in machine language. Type it in using the 128 version of "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: 1300
Ending address: 16A7

Before you exit MLX, be sure to save a copy of the program to tape or disk.

To install the program, type BOOT *"filename"* (tape users should type LOAD *"filename"*,1,1 and SYS 4864).

Taking Notes

Notepad 128 is great for ordering those scraps of information that often get lost on your desk. Use it to record notes on the current program, to maintain a list of frequently used phone numbers, or to schedule appointments.

To activate Notepad at any time, press the back-arrow key (←); then press RETURN. Notepad leaves BASIC undisturbed, so you can access it even while a BASIC program is running. (Of course, this action will halt the BASIC program.)

When you enter Notepad, you're presented with a menu of five options, explained below.

View Notes. This allows you to examine a note already in memory. When you've finished reading it, press any key to return to the menu.

Enter Notes. With this option, you can write a note up to one full screen in length—that's 1000 characters. All editing keys function normally. This includes CLR/HOME, which erases the screen with a keypress. Don't move the cursor below the bottom of the screen or the screen will scroll up, causing you to lose anything written at the top. To return to the menu, press the back-arrow key (←).

Save Notes. To store the current note to disk, enter a filename at the prompt. Be sure to use a name that's not on the disk or the file won't be saved. Note that the program doesn't alert you if a file by that name already exists on the disk—a blinking drive-error light is the only indication.

Load Notes. The program prompts you for a filename. If the file isn't on the disk, the drive-error light will blink.

Exit. This option returns you to BASIC, where you'll find any BASIC program already in memory intact.

Notepad 128 uses white text on a black background as its default colors. To change these, press B for border, S for screen, or C for character color. Any changes you make remain in effect until the computer is turned off. However, you can save a permanent copy of the program containing your favorite colors by entering

BSAVE"*filename*",P4864 TO P5792

See program listing on page 86. **G**

SPRITE FADER 64

"Sprite Fader 64," is a machine language utility that uses sprites to display a text string. It takes a given text string, converts it to a series of sprites, and then gradually fades it in at a specified location, one pixel at a time.

With text in sprite form, you can easily create banners with smooth-scrolling messages that fade in and out as they move across the screen. Sprite Fader 64 automatically moves the display sprites and can even accommodate custom characters in the text string.

"SPRITE FADER," A 128 TEXT-DISPLAY UTILITY WHICH ORIGINALLY APPEARED IN THE APRIL ISSUE, NOW HAS A COUSIN. HERE'S A VERSION OF THIS POPULAR PROGRAM FOR THE 64. A DISK DRIVE IS REQUIRED.

Peter M. L. Lottrup

Typing It In

Program 1, Sprite Fader 64, is written entirely in machine language. To enter it, use "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: CC00
Ending address: CFFF

Before you exit MLX, save a copy of the program to disk with the filename FADER 64.ML.

Program 2 is a demo that shows you how to use Sprite Fader 64 from within your BASIC programs. To prevent typing errors when entering this program, use "The Automatic Proofreader."

The Fading Effect

Sprite Fader 64 works much like the 128 version. To use it, you must call two routines. The first designates where the text string will be located on the screen, while the second identifies the string you wish to display. Both routines are called with the SYS command.

To position the text string, use a command of this format:

SYS 52224,*row,column,size*

Row and *column* represent the coordinates for the top left corner of the text-window display. Sprite Fader 64 uses the standard sprite-coordinate system, where the visible portion of the sprite screen includes locations 24–344 on the *x*-axis and 50–249 on the *y*-axis. But here, *row* and *column* are limited to the range 0–255.

The final parameter, *size*, is the expansion factor for the text (0–3). A value of 0 selects standard text size. A value of 1 makes the characters twice their normal height; a value of 2 makes them twice as wide; and a value of 3 doubles both

their height and width.

In addition to adjusting the size of the text, you can also alter its color. Quite simply, the color displayed corresponds to the current text color. This must be set prior to executing the above SYS. Set the text color as you normally would: with PRINT (by simultaneously pressing CTRL or the Commodore key and a number key 1–8) or with POKE (by storing the color value 0–15 at memory location 646).

When you call this setup routine, Sprite Fader 64 relocates the text screen at 51200 and clears it. (See "Program Notes" for additional details.) Thus, if you need to print anything on the screen, do so only after you've called the first routine.

The second call, which assigns the text string and causes it to materialize, is

SYS 52227,*string variable*,*movement direction*

String variable is any text string that's between 1 and 24 characters in length. Values outside this range cause an ILLEGAL QUANTITY error. Note that you must pass the text string to the routine in the form of a string variable (like A$), not a literal string (like "HI").

Movement direction determines whether the text display should move, and if so, in what direction. A value of 0 results in a static display. A value of 1 moves text left, 2 moves it right, 3 moves it up, and 4 moves it down. You can also control the scrolling direction by POKEing this value (0–4) directly into location 700.

After you've executed this second SYS command, Sprite Fader 64 creates the fade effect, building the text in sprite form pixel by pixel. To fade text out, just overwrite it with new text. Or, you can define *string variable* as " " (a single space enclosed by quotation marks) and repeat the second SYS call. Both approaches are demonstrated in Program 2.

Program Notes

Sprite Fader 64 uses all eight sprites to create the fading effect. To do so without affecting the normal BASIC program area, it temporarily reconfigures the 64's memory: The text screen is moved to locations 51200–52223 ($C800–$CBFF), character definitions (the uppercase/graphics set only) are copied to 49152–51199 ($C000–$C7FF), and sprite patterns are placed underneath Kernal ROM at 57344–58367 ($E000–$E3FF).

The changes most likely to affect you are the relocation of the text screen and repositioning of the character set. If you POKE or PEEK screen memory while the routine is active, be sure to use the new screen addresses. Also, since only the first 2K of character data is copied, the lower-/uppercase set is no longer available. At the same time, however, since the characters are now in RAM, they're more easily redefined (see the demo program).

When you've finished using Sprite Fader 64, to restore memory to its default configuration, press RUN/STOP–RESTORE or execute a SYS 52230 from within your program.

See program listings on page 78. **G**

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feedback

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

When Does 1 Plus 0 Equal 2?

As a beginning student of machine language, I thought that careful study of the source code for Charles Brannon's *SpeedScript* 3.2 might be unusually rewarding. I've learned a lot from Mr. Brannon's code, but at a number of places I don't understand why he does what he does. Why does he load the accumulator with the contents of a memory address and then add a 0 to it? For instance, in one location, he has the following:

```
LDA  CURR
ADC  #0
STA  LASTLINE
LDA  CURR+1
ADC  #0
STA  LASTLINE+1
```

My common sense tells me that what goes into LASTLINE and LASTLINE+1 is no different than what was found in CURR or CURR+1. What's going on here?

Wally Blake
Greensboro, NC

Your common sense would be correct except that you've overlooked one slight detail. If you look at this code again, you'll see that the machine language add instruction is ADC—ADd with Carry. ADC begins with the number in the accumulator and adds to it the given value (0 in this case), plus an additional 0 or 1, depending on the state of the carry flag. Thus, if a previous operation left the carry set, adding 0 would really add a 1.

A single byte can store values in the range 0–255; two bytes or more are required to store larger numbers. After adding a value to the low byte of a number, the carry bit may or may not be set, depending on whether the result is larger than 255. Adding 0 to the high byte (with ADC) takes care of the problem. If the carry bit is set, the high byte is automatically incremented by 1.

In the code above, if the result of adding the carry and 0 to CURR exceeds 255, the carry flag will be set when 0 is added to CURR+1 so that LASTLINE+1 is properly incremented.

MLX Modifications

In typing in your programs, I find myself making numerous copies as I progress through the listing. After a while, the disk gets full, and I have to stop and clean it up. So I thought, why not let "MLX" do it? I've included a partial listing for an update of the 64 version of MLX. It adds two options to MLX—one that reads the directory and one that scratches an old file.

Bill Tripp
Kennett, MO

I've included modifications to "128 MLX" that make it work with multiple drives. They will allow you to save to, load from, and catalog drives 8 through 11.

T. Dabney Tannehill
Chattanooga, TN

Being a regular reader, I always look for programs that I can enter from *Gazette*. I use "MLX" when appropriate, and find it extremely useful. I've even used it for finding starting and ending addresses of programs and for copying files from disk to disk.

The display feature is very handy, but I thought that it would be nice to be able to list a file to the printer. I've modified MLX so that the Display option can list the file to the screen or to the printer.

Ralph H. Rethoret
North York, Ont., Canada

We've combined Mr. Tripp's, Mr. Tannehill's, and Mr. Rethoret's ideas into modifications for both the 64 and 128 versions of "MLX." We've added new menu options that allow the user to scratch files from within MLX, to use multiple drives (either two drives, dual drives, or both), and to list files to the printer. In addition, we've added a directory option to the 64 version (the 128 version already has this capability).

The following additions and deletions are necessary to modify 64 MLX:

```
RC 115 DU=8:DN=0:DN$=MID$(STR$
       (DN),2)
PA 240 PRINT T$"{RVS}S{OFF}AVE
        FILE":PRINT T$"{RVS}C
       {OFF}ATALOG DISK"
FA 241 PRINT T$"{RVS}K{OFF}ILL
        FILE":PRINT T$"DRIVE
       {RVS}N{OFF}UMBER"
JS 242 PRINT T$"{RVS}Q{OFF}UIT
       {2 DOWN}{BLK}"
XM 260 A=0:FOR I=1 TO 8:IF A$=
       MID$("EDLSCKNQ",I,1)THE
       N A=I:I=8
GK 270 NEXT:ON A GOTO420,610,6
       90,700,1100,1210,1240,2
       80:GOSUB1060:GOTO250
QP 290 POKE SD+24,0:POKE56,160
       :END
EX 621 PRINT"{RVS}S{OFF}CREEN
       {SPACE}OR {RVS}P{OFF}RI
       NTER? ";
DX 622 GETPS$:IFPS$<>"S"ANDPS$
       <>"P"THEN622
MH 623 PRINTPS$"{DOWN}":IFPS$=
       "P"THEN1290
DH 750 PRINT"D{DOWN}":OPEN15,D
       U,15,"I"+DN$+":":B=EA-S
       A:IN$=DN$+":"+IN$:IF OP
        THEN810
BR 760 OPEN 1,DU,8,IN$+",P,W":
       GOSUB860:IF A THEN220
SC 810 OPEN 1,DU,8,IN$+",P,R":
       GOSUB860:IF A THEN220
HM 1100 PRINT"{CLR}{DOWN}{BLK}
        {RVS} DISK CATALOG
        {OFF}{DOWN}":OPEN1,DU,
        0,"$"+DN$:OPEN15,DU,15
        :GET#1,A$,A$
XG 1110 GET#1,A$,A$
DS 1120 S=ST:IFS<>0THENCLOSE1:
        GOTO1190
```

```
HD 1130 IFPEEK(653)THEN1130
XP 1140 GET#1,LO$,HI$
RH 1150 LO=ASC(LO$+CHR$(0)):HI
        =ASC(HI$+CHR$(0)):LN=L
        O+HI*256:LN$=MID$(STR$
        (LN),2)
BH 1160 PRINTLN$+" ";
HB 1170 GET#1,B$:IF B$="" THEN
         PRINT CHR$(13);:GOTO1
        110
CM 1180 PRINT B$;:GOTO1170
PK 1190 INPUT#15,EN,EM$,ET,ES:
        IFENTHENPRINTEN;EM$;ET
        ;ES
BQ 1200 CLOSE15:GOTO220
BG 1210 PRINT"{CLR}{DOWN}{BLK}
        {RVS} KILL FILE {OFF}
        {DOWN}":INPUT"NAME OF
        {SPACE}THE FILE TO SCR
        ATCH";SC$
KM 1220 OPEN15,DU,15,"S"+DN$+"
        :"+SC$:INPUT#15,EN,EM$
        ,ET,ES:CLOSE15
MF 1230 PRINTEN;EM$;ET;ES:GOTO
        220
KE 1240 PRINT"{CLR}{DOWN}{BLK}
        {RVS} CHANGE DRIVE NUM
        BER {OFF}{DOWN}"
XH 1250 PRINT"DISK UNIT NUMBER
         "DU:PRINT"{UP}
        {16 RIGHT}";
EG 1260 INPUTDU:IFDU<8ORDU>11T
        HEN1250
GS 1270 PRINT"DISK DRIVE NUMBE
        R "DN"{4 LEFT}";:INPUT
        DN:IFDN<0ORDN>1THEN127
        0
HG 1280 DN$=MID$(STR$(DN),2):G
        OTO220
CB 1290 OPEN4,4:PRINT#4,"MLX L
        ISTING FORMAT":PRINT#4
CD 1300 GOSUB1380:B=BS+AD-SA:F
        ORI=BTOB+7:A=PEEK(I):G
        OSUB1360:GOSUB380:PRIN
        T#4,S$;
MD 1310 NEXTI:PRINT#4,"= ";:A=
        CK:GOSUB1360:PRINT#4
CJ 1320 F=1:AD=AD+8:IFAD>EATHE
        NPRINT#4:PRINT#4,"**EN
        D OF DATA**":CLOSE4:GO
        TO220
DA 1330 GETA$:IFA$=R$THENGOSUB
        1080:CLOSE4:GOTO220
CX 1340 IFA$=S$THENF=F+1:GOSUB
        1080
CH 1350 ONFGOTO1300,1330,1300
MP 1360 B=INT(A/C6):PRINT#4,MI
        D$(H$,B+1,1);:B=A-B*C6
        :PRINT#4,MID$(H$,B+1,1
        );
FG 1370 RETURN
SF 1380 A=INT(AD/Z6):GOSUB1360
        :A=AD-A*Z6:GOSUB1360:P
        RINT#4,":";:GOTO370
```

Below are the modifications for 128 MLX.

```
XR 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280:DU=8:DN=0
MD 230 PRINT TAB(13)"{RVS}S
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}K
       {OFF}ILL FILE"
HH 231 PRINT TAB(13)"DRIVE
       {RVS}N{OFF}UMBER"RT$;TA
       B(13)"{RVS}Q{OFF}UIT
       {DOWN}{BLK}"
GF 240 GETKEY A$:A=INSTR("EDLS
       CKNQ",A$):ON A GOTO 340
       ,550,640,650,930,1000,1
       010,940:GOSUB 950:GOTO
       {SPACE}240
XP 561 PRINT"{RVS}S{OFF}CREEN
       {SPACE}OR {RVS}P{OFF}RI
       NTER? ";
GD 562 GETPS$:IFPS$<>"S"ANDPS$
       <>"P"THEN562
PE 563 PRINTPS$"{DOWN}":IFPS$=
       "P"THEN1060
JA 700 DOPEN#1,(F$+",P"),D(DN)
       ,U(DU),W:IF DS THEN A$=
       D$:GOTO 740
BB 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N]{4}
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$),D(DN),U(DU):PR
       INT:GOTO 700:ELSE PRINT
       "{BLK}":GOTO 660:BEND
DD 760 DOPEN#1,(F$+",P"),D(DN)
       ,U(DU):IF DS THEN A$=DS
       $:F=4:CLOSE 1:GOTO 790
FM 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),D(DN),U(DU)
       ,B0,P(BS):AD=SA+FNAD(17
       4)-BS-1:F=-2*(AD<EA)-3*
       (AD>EA)
RA 930 CATALOGD(DN),U(DU):PRIN
       T"{DOWN}{BLU}** PRESS A
       NY KEY FOR MENU **":GET
       KEY A$:GOTO 220
AD 1000 PRINTBE$"{RVS} KILL FI
       LE {4}{DOWN}":INPUT"NA
       ME OF FILE TO SCRATCH"
       ;SC$:SCRATCH(SC$),U(DU
       ),D(DN):GOTO220
RH 1010 PRINTBE$"{RVS} CHANGE
       {SPACE}DRIVE NUMBER
       {OFF}{DOWN}
DH 1020 PRINT"DISK UNIT NUMBER
         "DU:PRINT"{UP}
       {16 RIGHT}";
QQ 1030 INPUTDU:IFDU<8ORDU>11T
       HEN1020
DF 1040 PRINT"DISK DRIVE NUMBE
       R "DN"{4 LEFT}";:INPUT
       DN:IFDN<0ORDN>1THEN104
       0
CQ 1050 GOTO220
AA 1060 OPEN4,4:PRINT#4,"MLX L
       ISTING FORMAT":PRINT#4
HM 1070 PRINT#4,HEX$(AD)+":";:
       GOSUB 1140:B=BS+AD-SA
PP 1080 FOR I=B TO B+7:A=PEEK(
       I):PRINT#4,RIGHT$(HEX$
       (A),2);SP$;:GOSUB1150:
       NEXT I
RQ 1090 PRINT#4,"= ";RIGHT$(HE
       X$(CK),2)
FB 1100 F=1:AD=AD+8:IF AD>EA T
       HEN PRINT"{BLU}** END
       {SPACE}OF DATA **":GOT
       O 220
CJ 1110 GET A$:IF A$=RT$ THEN
       {SPACE}PRINT BE$:GOTO
       {SPACE}220
CB 1120 IF A$=SP$ THEN F=F+1:P
       RINT BE$;
BS 1130 ON F GOTO 1070,1110,10
       70
EE 1140 CK=FNHB(AD):CK=AD-Z4*C
       K+Z5*(CK>Z7):GOTO1160
MR 1150 CK=CK*Z2+Z5*(CK>Z7)+A
FF 1160 CK=CK+Z5*(CK>Z5):RETUR
       N
```

To scratch a file, select the KILL FILE option from the main menu and enter the name of the file to be scratched. MLX prints the number of files scratched and returns to the main menu.

Display a disk directory by selecting the CATALOG DISK option from the menu. Press the SHIFT key to pause the directory (64 version only). MLX returns to the menu after the last file is displayed.

Select the DRIVE NUMBER option from the menu to change the drive used by MLX. MLX prompts you for the unit number and then the drive number. MLX can address disk drives with unit numbers 8–11 and drive numbers 0 or 1.

To list a file to the printer, select the DISPLAY option from the menu. You'll be asked whether you want the output to be directed to the screen or to the printer. Press S to display the data on the screen as before. Press P to send the data to the printer.

Machine Language Assemblers

In the February 1989 issue, you published a short machine language routine in "Feedback." I don't have an assembler, so I couldn't try it. Is there any way I could use this routine without an assembler? If not, could you recommend a few good assemblers? Thanks.

John Huber
Teaneck, NJ

The machine language (ML) routine that you're referring to copied BASIC ROM to the underlying RAM. We provided the source code for this routine along with a BASIC loader that POKEd the ML into memory at location 828.

Since you have the BASIC loader, in this case you don't really need an assembler. Just type in the loader and run it; then type SYS 828 to execute the routine.

However, if you want to write a routine of any length on your own or modify an existing one, a good assembler would be handy. There are several around: Commodore's Macro Assembler Development System (MADS), *Eastern House Software's* Macro Assembler/Editor (MAE), *Richard Mansfield's* LADS *from* The Second Book of Machine Language *(Chilton Books), and Roger Wagner's* Merlin *are all quite popular. But probably the easiest one for the beginning ML programmer to use is* PAL 64 *(or* Buddy 64*), distributed in the United States by Spinnaker as part of its Better Working series or in Canada by Pro-Line Software.* **G**

BASIC for beginners

More Musical POKEs

Larry Cotton

Programming music on the Commodore 64 isn't as difficult as you might think. Only one BASIC keyword—POKE—is predominantly used. What to POKE where and when becomes the challenge.

This month we'll actually program a short tune. But first, I promised to tell you how to calculate the POKE values which control a sound's envelope.

The ADSR Envelope

Recall that the sound envelope consists of four phases—*attack, decay, sustain,* and *release,* sometimes abbreviated ADSR. For voice 1, the first two are controlled by a number that is POKEd into 54277; the last two are controlled by a number that is POKEd into 54278.

As we learned last month, there are 16 possible settings each for attack, decay, sustain, and release. The attack and sustain portions of a sound's envelope are incremented by 16 from 0 to 240; decay and release are incremented by 1 from 0 to 15.

Here's how to decide what to POKE into the two memory registers that control the envelope: For the attack/decay register, choose an attack value from 0 to 15, multiply it by 16, and then add a decay value from 0 to 15. POKE that number into memory register 54277. For the sustain/release register, multiply a sustain value from the range 0 to 15 by 16 and add a release value from the range 0 to 15. POKE that number into register 54278.

Note that if sustain is 240, there will be no decay. If sustain is 0, there will be no release. The two POKEs we used last month to control the ADSR envelope are:

```
POKE 54277,12
POKE 54278,90
```

The first POKE sets attack and decay. We wanted a very fast attack (the sound level rising very quickly), so we picked the lowest value, 0. Multiply that by 16 to give 0, and then add a fairly high decay rate of 12.

The second POKE sets sustain and release. We wanted to use a sustain value which would let the note sound continuously, so we picked a value of 5. Multiply that by 16 to give 80, and then add 10 for a medium-length release. This produces an overall value of 90.

Usually, you determine ADSR values experimentally—simply by trying different values until you've achieved the desired effect.

Programming a Tune

Now let's put our knowledge to work by programming a simple tune in one voice. Please pay particular attention to the programming sequence; I've found it's the most logical order in which to program music. Start by clearing the sound chip:

```
10 FOR J=54272 TO 54296:POKE
   J,0:NEXT
```

Now, set the volume to maximum:

```
20 POKE 54296,15
```

Then, specify the envelope. For convenience, we'll use last month's values:

```
30 POKE 54277,12:POKE 54278,90
```

Next, assign the notes' pitch values by reading them from DATA statements and POKEing them into the appropriate memory registers:

```
40 READ P1,P2:IF P1=-1 THEN POKE
   54276,32:END
50 POKE 54273,P1:POKE 54272,P2
```

We use an IF-THEN statement to detect when we reached the end of the song. (This will become clearer in a moment.)

Notice a difference here from last month, where we POKEd only 54273 with a value. We need more specific pitches to create an accurate-sounding song. Thus, we use the register at 54272 to "fine-tune" each pitch. Later, we'll add the DATA statements that contain the note values.

We've set the overall volume and given the notes an envelope and a pitch. What else do we need to do? We need to turn on the notes in a particular voice. Let's choose the sawtooth waveform, since it's distinctive-sounding and a little easier to program:

```
60 POKE 54276,33
```

The note has been turned on; its volume has increased through the attack phase and decreased slightly through the decay phase and is now sounding at the sustain level. We must make the note sound for a particular length of time, which is determined by the next line:

```
70 READ D:FOR T=1 TO D:NEXT T
```

The note data is organized into sets of three values: two for each note's pitch and one for the length of time each note sounds. We use a simple FOR-NEXT loop to determine how long a note sounds, although there are other ways to create delays, such as using one of the computer's built-in clocks.

When the delay is finished, we turn the note off. This is done, as you'll recall, by decreasing the waveform value by 1:

```
80 POKE 54276,32
```

This line triggers the note's release; its volume decreases from the sustain level to 0.

Before we start the ADSR sequence for the next note, we need to make sure the current note has finished playing. To produce an audible break between notes, we insert a slight delay:

```
90 FOR D=1 TO 50:NEXT D
```

Then, we can return to the pitch-reading line:

```
100 GOTO 40
```

G

Testing the Program

I've always said that it's a good idea to test a program at every possible stage; we've reached a good place to do just that. All we need is a data line:

```
110 DATA 22,96,1000
```

The first two numbers control the pitch (I'll show you where they came from shortly), and the third number controls the duration of the note. Run the program. You should hear a note (F above middle C on the piano) played as the program reaches line 100.

When control returns to line 40, the computer attempts to read more data and finds none. An OUT OF DATA error message is printed—but that's all right, since we only had one group of data.

A Short Tune in F Major

If your test has been successful, it's time to add the remaining data. The tune is the first seven notes of a Mozart sonata, transposed to the key of F. Here's the data:

```
110 DATA 22,96,1000,28,49,400,33,135,400
    ,21,31,700,22,96,50,25,30,50, 22,96,1000
120 DATA -1,-1
```

Note that the data is presented as seven groups of three numbers, plus two −1s. The pitch values come from the "Music Note Values" table in the appendix of the *User's* and *Programmer's Reference Guide;* the durations are arrived at more or less experimentally.

The last two data items are used as flags; they cause the tune to stop playing without printing an error message. In this case, we use two bogus numbers (typically negative) since we're reading in two items of data—P1 and P2, in line 40. In this line, we check to see whether P1 is −1. While the tune is playing, it's some other value. After the last note has played, P1 and P2 are read as −1. When this occurs, we turn off the last note and end the short tune by POKEing 54276 with 32.

If you run the program now, it should play Mozart's short musical phrase without error. And by simply placing different note and duration values in the DATA statements, you can play any tune.

Creating Your Own Table

Music buffs, take note: You can create your own music-note value table knowing that the highest playable note on the Commodore 64 (B on the seventh octave) has an oscillator frequency of 64814. You can calculate all other note values from 64814 by successively dividing by the twelfth root of 2.

Start by typing PRINT 64814/2↑(1/12) and pressing RETURN. You should get (rounded off) 61176. That's the decimal oscillator frequency for the 64's highest A sharp. Divide this unrounded number (61176.2697) by the twelfth root of 2 to yield 57743 (rounded), the decimal oscillator frequency for A, and so on.

Here's a short program that generates all the oscillator-frequency values as well as the high and low bytes to POKE into 54273 and 54272, respectively, for voice 1.

```
10 DIM F(95):F(95)=64814
20 FOR I=94 TO 0 STEP
   -1:F(I)=F(I+1)/2↑(1/12):NEXT
30 FOR I=0 TO 95:F(I)=INT(F(I))
40 H=INT(F(I)/256):L=F(I)-H*256
50 PRINT F(I),H,L
```

Well, we haven't even touched on PEEK. Let's save that for another column, when we will cause Mozart to be played with *vibrato!* **G**

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machine language programming

Wraparound Numbers

Jim Butterfield

We all know that when the odometer on a car (or the counter on a tape recorder, for that matter) reaches its maximum value of 999999, it wraps around to 0 as it increases and continues from there. The same is true of binary numbers stored within a computer.

An eight-bit number—such as those found in the computer's registers or in a cell of memory—hits its maximum at 255. Increase it beyond that, and it goes to 0. When you want to handle numbers that go higher than this, you use two or more bytes in tandem to do the job. Even then, there's a limit. A two-byte group will hold unsigned integers up to a value of 65535; then it rolls over to 0 and starts again.

We often don't mind this kind of behavior. We know that clocks run for 12 or 24 hours and then restart. Computer clocks often work in a similar fashion, and if you're using them for short-term time measurements, this isn't a problem. If you're asked the time difference between 11:15 and 1:25 on an actual clock, you do the wraparound almost without thinking.

In the same way, computers take this kind of thing in stride: How far is 12 ahead of 240 in a single-byte number? The SBC (SuBtraCt) command produces 28 automatically; the concept of a rollover at 255 fits right in. Checking the carry bit would reveal that this was a peculiar subtraction, in that a borrow was involved. But nevertheless, the answer is correct.

Negative Indexing

An interesting application of number wraparound is in zero-page indexing. Indexing, using the X or Y registers, is always in the positive direction; the effective address is always higher than the operand address. Except in this case.

When zero page is specified in the addressing mode, the resulting address can't get out of zero page, no matter what indexing says. Thus, if the X register contains a value of $90, and you execute the command LDA $98,X, the resulting address is not $128; instead, it's $28. You've gone around the corner, and the effect of indexing was to produce a *lower* address. Note that this is true only in zero-page mode: The instruction LDA $0098,X would indeed reach $128.

In most cases, it doesn't matter. You can handle the addresses you choose whether indexing is negative or positive. But in the early days of limited memory (and byte-counting programmers), this allowed a bit of elegance in the code. Let's show this by first doing a standard indexed loop. Suppose my task was to set five locations to 0, starting at address $EB and going up. You might write

```
      LDA  #0
      LDX  #4
LOOP  STA  $EB,X
      DEX
      BPL  LOOP
```

You can see that I've saved a compare instruction, by "catching" the register as it passes 0. In most cases today, this is vanity: We usually don't mind the two bytes and two microseconds of time, since adding the compare instruction makes our coding less bug-prone.

In the same way, however, we might say: Let's write a program to clear the five locations *below* (not including) address $EB. Using negative indexing, you would write

```
      LDA  #0
      LDX  #$FB
LOOP  STA  $EB,X
      INX
      BMI  LOOP
```

The value $FB is equivalent to −5 because of wraparound. As you walk the index up, it finally tops out at 0, and the loop is finished. Again, no compare is needed.

Do not feel there is any need for you to use crafty code of this type or any other. What you save in coding time, you often lose many times over in debugging time. Smart coding is not always clever coding.

Which Way?

Is 10 a.m. before or after 2 p.m.? Does November come before or after February? Literally, the an-

Figure 1. Wrap-around Wheel

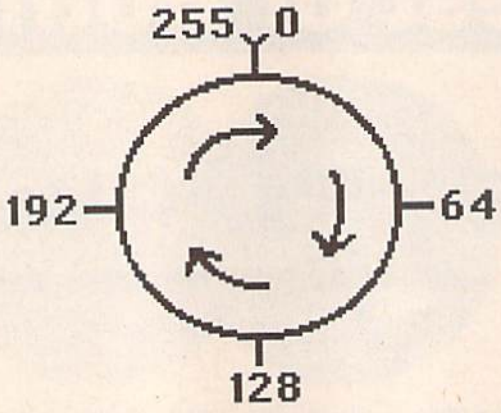
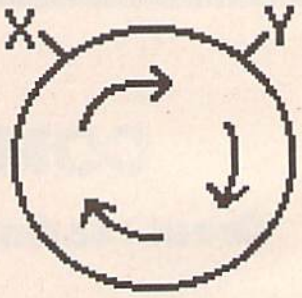


Figure 2. Which comes first—X or Y?



swer to these questions is *Both.* It depends on point-of-view. Practically, we have an intuitive sense of which would come first in such cases; for the first, you'd almost certainly say "before," if you were answering in the daytime. How do you do this and can the computer do the same? Even in BASIC coding, some programs get tripped up because TI$ (and TI) wrap around at 24 hours.

We can illustrate the question with a couple of diagrams. Figure 1 shows the concept of wraparound as a wheel: There's no end, as you go from 0 to 255 and then start over.

Figure 2 poses the question graphically: Is point X ahead of point Y or behind it? You can see that the answer depends on whether, in traveling the shortest distance from X to Y, you go forward (clockwise) or backward (counterclockwise). Fortunately, there's a simple computer test that determines this for you.

If you compare the values of points X and Y, several flags in the status register are set. If the two values are equal, the Z flag is set. If the number in the register is less than the other number, the C flag is cleared. This last test, using the C flag, is the normal "greater than or equal to/less than" comparison method. But one more flag is affected by a comparison: the N flag. For conventional number comparisons, it's not too useful. But it neatly solves the wraparound question *Which way around is the fastest?*

If you LDA (LoaD A) with value Y and CMP (CoMPare A) with value X, the N flag is set if point X is ahead of point Y, in a wraparound sense. Otherwise, the N flag will be clear. Commands BMI (Branch if MInus) and BPL (Branch if PLus) allow you to test these conditions.

This is often especially useful knowledge if you're tracking a timer. Suppose you've precalculated an event time—that is, when your program should take a certain action, such as move a sprite, play a note (see last month's column), or whatever. You can watch the timer (perhaps the TI clock, perhaps a hardware timer register) and wait for the chosen time to arrive. It won't matter if the timer byte wraps around. If you do your compare right, you'll catch it every time. **G**

bug-swatter

• In the February 1989 installment of this column, we promised a correction for "Font Grabber" (November 1988). With help from the author, we've finally discovered a solution. Font Grabber doesn't handle full 8 × 8 character sets correctly. To correct the problem, line 950 should be changed as follows:

```
950 IFI=10THENPRINT#1,"U2"2;0;T;S
    :GOTO1010
```

• One character is missing from the listing of "Bacteria" (March 1989). The 512 in line 50 should be 5120.

```
50 FORT=5120TO5905:READW$:POKET,D
   EC(W$):NEXT:POKEDEC("1448")
   ,0:GOSUB310:DIMAN(258)
```

• "The GEOS Column: Help Pad" (June 1989) has a problem with its word-wrap routine. The following BASIC program, HELPPAD-.PATCH, loads and corrects the program:

```
PR 10 IFA=0THENA=1:PRINT"{CLR}LOA
      DING....PLEASE WAIT.":LOAD"
      HELP PAD",8,1
RB 20 PRINT"{2 DOWN}PATCHING....P
      LEASE WAIT.":SA=79*256
RG 30 FORA=SA+256TOSA+254STEP-1:P
      OKEA,PEEK(A-2):NEXTA
CP 40 FORA=SA+2985TOSA+1791STEP-1
      :POKEA,PEEK(A-2):NEXTA
GS 50 FORA=SA+2987TOSA+3021:POKEA
      ,PEEK(A+1):NEXTA
AG 60 FORA=SA+3061TOSA+3030STEP-1
      :POKEA,PEEK(A-1):NEXTA
DK 70 FORA=SA+3214TOSA+3310:POKEA
      ,PEEK(A+11):NEXTA
GE 80 FORA=0TO151:READB:POKESA+30
      62+A,B:NEXTA
HG 90 FORA=0TO20:READB,C:POKESA+B
      ,C:NEXTA
RG 100 PRINT "WORD WRAP REPAIRED.
       "
KG 110 PRINT"{2 DOWN}DEFAULT COLO
       R FOR HELP PAD [1-15]";
BP 120 INPUT C:IFC<1ORC>15THEN120
MP 130 POKE SA+3245,C:PRINT"
       {2 DOWN}SAVING....PLEASE W
       AIT."
KC 140 POKE43,0:POKE44,79:POKE45,
       240:POKE46,91:SAVE"HELPPAD
       .FIX",8:END
JA 150 DATA26,201,32,208,10,166,2
       4,142,210,90,166,25,142,21
       1,90
AH 160 DATA32,69,193,230,32,165,3
       2,208,0,76,237,90,169,0,14
       1
KR 170 DATA171,132,141,172,132,96
       ,160,0,177,32,201,32,240,7
       7,174
PJ 180 DATA210,90,134,24,174,211,
       90,134,25,32,115,91,169,0,
       141
CB 190 DATA171,132,141,172,132,16
       9,46,133,55,160,0,169,32,1
       40,204
AP 200 DATA90,32,69,193,172,204,9
       0,200,192,40,208,240,169,1
       3,32
KQ 210 DATA69,193,169,24,160,91,1
       41,171,132,140,172,132,169
       ,42,133
JJ 220 DATA55,160,0,177,32,201,0,
       208,3,104,104,96,32,69,193
DD 230 DATA96,169,13,32,69,193,96
       ,160,0,177,32,201,32,240,8
RQ 240 DATA162,32,32,117,193,76,1
       15,91,24,230,32,144,3,238,
       12
JJ 250 DATA91,96,64,130,67,250,69
       ,239,70,92,74,101,252,252
BS 260 DATA253,79,1794,140,1906,2
       12,2986,7,3004,212,3029,0,
       3032,24
MR 270 DATA3217,210,3232,208,3235
       ,209,3240,211,3256,211,325
       9,211,3279,170
HE 280 DATA3287,210
```

To correct Help Pad, you'll need four programs: HELPPAD.BASIC, HELPPAD.ML, HELPPAD.PATCH, and GEOCONVERTER. Place copies of all four programs on the same GEOS work disk; then load and run HELPPAD.BASIC. It loads HELPPAD.ML, modifies it, and saves the resulting file as HELP PAD. Next, load and run HELPPAD.PATCH. HELPPAD.PATCH loads HELP PAD, inserts the corrected word-wrap routine, and saves the corrected file as HELPPAD.FIX.

During the patching process, you'll be prompted for a default color for HELP PAD. Enter the color value (1–15) for the background color you wish HELP PAD to have when it opens. When HELPPAD.PATCH has finished, turn off your computer to reset some pointers changed by the program. Next, you must load and run GeoConverter. When it prompts you for a filename, enter HELPPAD.FIX.

Load GEOS and test your corrected program by copying a help file to the GEOS work disk containing HELPPAD.FIX. Select the work disk and then select HELPPAD.FIX from the GEOS menu. **G**

THE programmer's page

Programmer's Survival Kit

Randy Thompson

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

There are some things that I just won't program without. *Commodore 64 Programmer's Reference Guide* is one of them. The charts and tables listed in this book—specifically the list of ROM Kernal routines—are indispensable. For the sake of convenience, my reference guide lives open-face next to my computer, along with several other dog-eared items.

No 64 programmer should be without *Mapping the Commodore 64 and 64C.* It's a cornucopia of information, documenting every memory location found in the 64. I used my first copy so much, I wore it out and had to buy another. Commodore 128 owners should check out the book's sister publication, *Mapping the Commodore 128.* Both titles are from COMPUTE! Books.

For serious machine language hackers who want to know exactly how the 64's operating system works, Abacus's *Anatomy of the Commodore 64* is truly a must-have. Forget the first half of the book; it's Appendix A that matters. Appendix A is a complete disassembly of the 64's BASIC and Kernal ROM, and the code is fairly well commented. The wording is a bit awkward, however, since the text was translated from German to English (quotation marks are often referred to as inverted commas). With careful study of the 64's internal code, you can better understand how the computer works and how you can make it work for you.

Subroutine Library

A programmer's survival kit shouldn't be limited to books. Experienced programmers keep a library of commonly used subroutines on disk to speed up program development. Have a great error-handling routine? Save it to disk. How about the interrupt-driven animation routine you wrote for that space game? Extract it and save it along with all your other multipurpose creations. With a large enough library, you can create stand-alone software simply by gluing together a series of prefabricated subroutines. If you program in BASIC or edit machine language source code using the BASIC editor, you'll want a merge utility to bring the subroutines from disk into the program in memory (see "Program Merge" in the December 1988 *Gazette).*

Prewritten BASIC subroutines should be saved with unique line numbers. You don't want to have two different routines start at line 1000. A good renumbering utility can keep your routines from conflicting. *Gazette*'s "MetaBASIC," published in the February 1987 issue, has both a line-renumbering command and a program-merge command.

Many of the tips sent to the "Programmer's Page" are perfect candidates for becoming part of a subroutine library. Here are a couple subroutines to get your collection started.

Formatted Numbers

The following subroutine aligns numbers by their decimal point. To use it, set X equal to the number to be printed, set N equal to the number of decimal places to be used, set T equal to the number of spaces the rightmost digit will be from the left margin, and then GOSUB 1000.

```
EP 1000 N$=LEFT$("00000000",N)
        :X=INT(X*10↑N+.5)/10↑N
        :X$=STR$(X)
JM 1010 FOR Z1=1 TO LEN(X$):IF
         MID$(X$,Z1,1)<>"." TH
        EN NEXT
GB 1020 X$=X$+MID$("."+N$,LEN(
        X$)-Z1+2):PRINT TAB(T-
        LEN(X$))X$
SB 1030 RETURN
```

To give the program a try, add this line and enter RUN:

```
FD 10 N=2:T=13:FOR I=1 TO 5:X=
      RND(0)*1234:GOSUB 1000:N
      EXT:END
```

This should give you a good idea of how the subroutine works.

Paul Follini
Amherst, N.S.
Canada

Unscrollable Lines

Here's a short machine language subroutine that protects the computer's top two lines from being scrolled off the screen. You may still print text to these lines and erase them by clearing the screen. You can use the unscrollable lines to display your location in a text adventure or to show the disk drive status in a utility program.

```
KM 3000 FOR I=828 TO 875:READ
        {SPACE}D:POKE I,D:NEXT
        :SYS 828
AD 3010 POKE 59639,1:POKE 6498
        2,53:POKE 1,53
ER 3020 RETURN
AH 3030 DATA 160,0,132,38,169,
        224,133,39,177,38,145,
        38,200,208,249,230,39,
        165
PD 3040 DATA 39,201,0,208,241,
        160,0,132,38,169,160,1
        33,39,177,38,145,38,20
        0,208
GK 3050 DATA 249,230,39,165,39
        ,201,192,208,241,96,0
```

To use it, simply GOSUB 3000 whenever you want to protect the top two screen lines. This subroutine needs to be executed only once when your program is first run.

Sean Ganess
Woodside, NY **G**

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64 vs. Nintendo: The Debate Continues

Fred D'Ignazio

In this column two months ago, I asked Gazette *readers to tell me whether they thought Nintendo games were as good as games for the 64. I know how loyal 64 owners are to their machine, so I shouldn't have been surprised when I received such a huge response. Here are excerpts from some of the many fine letters I received.*

Hype vs. Reality

Nintendo's claim of catching 87 percent of the market is a bit optimistic. This is because their games are often unavailable. If Nintendo had the ability to keep its users captured, why do my two nephews keep pestering me to let them play the games that I have for my 64, some of which are COMPUTE!'s programs, like "Powerball"?

—Charles J. Fogerson, Soap Lake, WA

How Nintendo Got Started

Yes, it is an invasion, but we are to blame. It is we who built the [Nintendo] company profits by playing arcade games that are now enjoying successful adaptation on the Nintendo. Isn't that how Nintendo got its start? All those quarters that we pumped into the videogame machines are only now coming back to haunt us.

—Joseph Shannon, Montoursville, PA

What Commodore Should Do

Commodore could bring out some new peripherals like a light gun to play shooting games (like on the Nintendo) or a keyboard to make use of the superior sound of a 64. To help new buyers get started, they should produce programs on cartridges so a person would not have to buy a disk drive when buying a computer.

—Glen Edwards, Jr., Kokomo, IN

I think Commodore should advertise on TV, showing games like *Neuromancer.*

—Bill Ward, Jr., Clayton, NC

The 64's Strengths

The Nintendo doesn't have a keyboard, and I haven't seen any full-screen digitized pictures in Nintendo games. Also, I think that interactive fiction games like Infocom's *Zork Zero* are one of the keys to the 64's success.

—Rick Grossenbacher, Rockford, MI

Can the Nintendo do electronic spreadsheets, checkbook balancing, telecommunications, printing and storing documents, or user-programmable sound and graphics? As for cost, can you pick up *Pac Man, Ms. Pac Man, Super Pac Man,* and *Baby Pac Man* for as low as $9.98 for the Nintendo? Try $35.00 to $40.00!

P.S. This letter was typed on a 64. Let's see any Nintendo do that!

—David Morse, W. Burlington, IA

Nintendo's Strengths

My eight-year-old nephew has a Nintendo and loves it. I thought this would be a great time to get a 64 review from a Nintendo kid. As he looked through my 64 software to pick out a game, I started to give directions on how to handle the software and disk drive. Before I could finish he said, "I just want to use a cartridge and start playing." After about 15 minutes into a game he said, "This is great, but how come it takes so long to start the game again and why do I have to keep turning the disk over and over all the time?" Shortly after, he started complaining that his hand was too small for the joystick. He tried three other joysticks, but he either had the same problem or the joystick didn't have the dexterity needed to play the game. He then said, "I wish I could use my Nintendo controls on your Commodore." Soon after, he quit and went right to his Nintendo.

—Ann Tancredi, San Diego, CA

Disk vs. Cartridge

Commodore should get back into the cartridge market because that's what is selling, and cartridges are harder to copy. Pirates are to blame, at least partly, for the reduced sales of Commodore products due to illegal copying. Wouldn't you, as a software producer, center your guns on a medium that is very difficult to copy, such as one that supports cartridge format?

—Joseph Shannon, Montoursville, PA

The best reason for 64 games is the numerous saving positions a single disk can hold. A Nintendo game may have RAM, but that has to be maintained by a battery! No floppy disk I know of has to be supported like that. You can save a position and not even think about it for years and it would still be the same as you last left it.

—Bill Ward, Jr., Clayton, NC

A Final Word

You may have trouble believing this 13-year-old kid could say so much against something so complex as Nintendo, but I have a lot more I can't put into words right now. So if any of you out there think Nintendo is so hot, try taking another look. And as for Dennis's position, I would back him up any day. Thank you!

—Bill Ward, Jr., Clayton, NC

Keep Writing!

Well, readers, what do you think? Do you agree with these readers' opinions? Please write to me:

Fred D'Ignazio
c/o COMPUTE!'s Gazette
324 W. Wendover Ave.
Suite 200
Greensboro, NC 27408 **G**

horizons

The Other Side of the Fence

Rhett Anderson

It's often said that the grass is always greener on the other side of the fence. No matter which computer you have, it's easy to look over at the competition and wish for some feature: better software, more memory, more colors. Commodore 64 and 128 owners do that, Amiga owners do, IBM PC owners do, and even Macintosh owners do. But more about the Mac later.

First, Reader Mail

Is the 128 a dinosaur? (See July "Horizons.") Boy, you readers sure have your opinions. I haven't seen so much mail since I printed excerpts from a pirate's letter. Surprisingly, the response was about 50/50. The half that thought the 128 was a dinosaur was mostly sad (or angry with Commodore). The other half was universally angry—at me!

This first excerpt is from a letter to the editor by Norman Morrison of Oxford, Alabama, who is canceling his subscription to *Gazette*. He cites a number of reasons. First, our staff is excited by our new startup, *COMPUTE!'s Amiga Resource*. Second, we're not denouncing Commodore's "idiot policies." Third, me:

> The final straw was your star columnist, Rhett Anderson. "The Commodore 128—A Dinosaur" [mildly offensive verb deleted]. It smacks back to the good old days when 64 users were taking their potshots at the 128. Let me guess, Rhett is a closet 64 user who sees a chance to put a nail into the lid of the despised 128. Or, perhaps Rhett is an Amiga user who is forced to do 64 and 128 articles. Could he be a mole for the PC clone industry? Naw, I think he's just an extension of the thinking at *Gazette* that's fixing to lose this here reader.

Well, honestly, I didn't think I was taking potshots at the 128. And as far as I know, there is no coherent PC clone industry that would be willing to pay me for what I do—write programs, edit articles, and write columns about Commodore computers.

Another letter comes from Thomas Sands of the Bronx, New York. He's been the owner of a Commodore 128 since 1985.

> I never had a moment's trouble from my 64, but the 128 was a horse of a different color. The first one had faulty ROMs, which manifested itself within 24 hours. The dealer made a no-questions-asked exchange. In the second one, the ROMs went bad in a week. . . .
>
> Not having the funds to purchase an MS-DOS machine, I decided to try to boot up the CP/M side of the 128. The first step was to update my system disk and to purchase a replacement utilities disk. I've spent at least $20 on the phone with Commodore trying to get these disks.
>
> Personally, I will not ever buy or encourage anyone to purchase anything made by Commodore.

Another letter comes from James Lambert of Hastings, Nebraska.

> I am using a Commodore 128 with two 1571 disk drives, having upgraded from a 64 and two 1541s. If Commodore no longer makes an 8-bit computer compatible with the Commodore 64 and 128 when I am ready for a new computer, Commodore will be the last on my list of possibilities. What sort of idiot is running things at Commodore anyway?

In Commodore's defense, I would like to say that the company has kept up support for the 64 and 128 for a long time. In fact, the 64 is one of the longest-lived and the most successful of the 8-bit machines. Remember, Commodore has made RAM expansions, mice, a 3½-inch drive, and the 128 and its peripherals. What do users want from this company—blood? On the other hand, your letters show that Commodore has really fumbled the ball when it comes to keeping its loyal customers happy.

Over the Fence

I read magazines, a lot of them. It's not because I work at a magazine—it's something I've done as long as I could read. I even read computer magazines that are written for the owners of computers that I've never really grown close to. I read *Byte*, *InfoWorld*, *PC World*, *MacWorld*, *MacUser*, and many others. I read these to see what's going on with other computer formats. It's a practice I recommend; it gives you a nice sense of perspective.

I don't like everything I read. For instance, today I read in the June 1989 *MacUser* an interesting column by Louise Kohl, *MacUser*'s executive editor. She says (and I'm being a bit unfair by presenting her words out of context), "The success of the Mac in the 'real' world is what keeps it around for the rest of us to use in pushing our personal envelopes. Without that success, Macs would have long since joined Commodore 64s in closets all across America."

Is the 64 a closet computer? The letters I get say *No*. Perhaps it wouldn't hurt if Ms. Kohl received some letters from the hundreds of thousands (if not millions) of people who take the 64 more seriously. **G**

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THE geos column

Head to Head: Writer 64 vs. Word Publisher

Robert Bixby

Which is better, Timeworks' *Writer 64* or Spinnaker's *Word Publisher?* People who know the peculiar story of these two GEOS-compatible word processors might smile—or snarl—at the mention of this subject.

The fact is, they are virtually indistinguishable. As soon as my review of *Writer 64* appeared a few months ago, I received letters from *Word Publisher* owners asking if *Writer 64* and *Word Publisher* were the same product (see "The Inside Story"). The answer is that they are not the same product, not quite. They are remarkably similar, and for a few very good reasons. Primary among these is that they share the same programmer.

Evidently, when GEOS began to be sold with Commodore computers, the major software companies began to feel compelled to provide GEOS-compatible products. First Spinnaker and then Timeworks purchased GEOS-compatible word processors from Ancier Technologies.

It's important to understand that these products are virtually the same, though there are enough differences to justify recommending one over the other.

Face-Off

To try them out, I set them both up, running on practically identical systems: *Writer 64* on a Commodore 64 with a 1541 disk drive and *Word Publisher* on a 128 in 64 mode with

The Inside Story

In response to my review of Timeworks' *Writer 64* (April), I received letters from readers stating that the product sounded very much like Spinnaker's *Word Publisher.* One writer even wrote to tell me he believed they were the same product.

Since I hadn't seen *Word Publisher,* I phoned Spinnaker immediately to see if it had sold product rights to Timeworks or if it was engaged in some sort of simultaneous publishing agreement. The spokesperson assured me that the products were distinctly different and that *Word Publisher* was created specifically for Spinnaker. I then contacted Timeworks. The Timeworks spokesperson stated that the programs were different and suggested that any similarities between the two could be explained because both programs were from the same development house. But, he said, Timeworks had arranged to have significant portions of the code rewritten and was offering a quality user manual.

As described in the accompanying column, the programs are similar but not identical. And the differences are systematically in favor of one package over the other.

When Commodore introduced the 64C, it decided to include *geoWrite* (the earlier, less fully featured version) with the new machine. Both Spinnaker and Timeworks wanted to provide alternatives.

Spinnaker had intended to include *GEO* in the name of its word processor, but GEOS publisher Berkeley Softworks is said to have advised against it. Spinnaker then decided to pair the name with one of its MS-DOS word processors, *PC Word Publisher.*

The actual creation of the software is a saga in itself. Ancier Technologies, which produces about 90 percent of Spinnaker's product line, had access to a device known as an *In-Circuit Emulator* (ICE). This is a very expensive piece of equipment that can cost $20,000 or more, and it was very difficult to find one that would operate with a 6510 chip, the CPU of the Commodore 64. Eventually, one was located in England and the development of *Word Publisher* began.

ICE provides an external operating system, allowing the programmer to trace the actions of the computer step by step—something like slowing down the 6510 chip to a virtual standstill so its behavior can be observed and recorded. In this way, Ancier became privy to the undocumented capabilities of the GEOS operating system.

Meanwhile, according to my sources, Timeworks realized it would be unable to create a finished GEOS word processor within the necessary time constraints. Timeworks approached Ancier, which had begun to develop software for companies other than Spinnaker. Ancier discussed the project with Spinnaker and received Spinnaker's approval.

Ancier, armed with its ICE, its knowledge of the operating system, and already in possession of a library of GEOS word processing routines, was quick to comply. Ancier provided Timeworks with a product that could easily be mistaken for the Spinnaker word processor, for reasons that should by now be obvious. The major changes from the Spinnaker product are in the menu design (Spinnaker and Timeworks have different preferences for menu structures, based on structures found in their other products), and cleaner and more carefully crafted routines beneath the surface.

—*R.B.*

a 1571 drive in single-sided mode. Both were driven with Epyx joysticks. Each program was run simultaneously under GEOS 2.0. (At the same time, this column was written on a Commodore PC set up between the two 64s. Three computers at once—hacker heaven.)

According to the files, *Word Publisher* is 41K and was completed February 5, 1988, at 3:43 p.m. *Writer 64* is 43K and was completed August 8, 1988, at 2:01 p.m. Dr. Brachman is listed as the creator of both products. Both are described as "ultrafast, full-featured GEOS-based" word processors.

Writer 64 comes with the set of fonts that comes with the standard GEOS system: Roma, Dwinelle, California, Cory, and University. *Word Publisher* comes with more sample texts, but it has no fonts other than the system fonts. Each packs 29 apparently identical printer drivers. *Word Publisher* has a copy of the deskTop (version 1.3) on disk, so if you happen to be using that particular version of GEOS, you can save a few disk swaps. (I had forgotten how swap-happy you can get running GEOS with only one, single-sided disk drive.) Both have spelling checkers that operate identically.

Dr. Brachman loses my prize for programmer of the year. Using either package, trying to create a file on a copy-protected disk resulted in a disk error with no way to back out. It repeatedly demanded a disk containing the file I was trying to create. The only recourse was to reboot. (GEOS software designers: Please always provide a CANCEL button.) Incidentally, the Timeworks disk is write-protected and the Spinnaker disk is not. This presents a small problem because it's difficult—perhaps impossible—to copy files with GEOS from a write-protected disk. I had to cut a notch with scissors to copy the necessary files to a work disk.

The main menus differ only slightly, and, to my eye, there are a few differences in the layout of the user interfaces of the two packages. The majority of advantages are in *Writer 64*. For instance, creating an ASCII version of my GEOS file is described better by the Export to ASCII option on *Writer 64*'s File menu than it is by the File option on *Word Publisher*'s Print menu. For another example, *Writer 64*'s Show Full Page and Show Reduced Page seem to tell me more about the operations than do *Word Publisher*'s View and Preview.

The number of menu items in *Word Publisher* appears to be greater, but the features of the two programs are the same. For example, if you select Margins in *Word Publisher*, you will be provided with a submenu to specify margins to set. *Writer 64* lists each margin individually in the Page menu.

Cursor movement in *Word Publisher* is jerky and slow; in *Writer 64*, it's smooth and relatively fast.

As far as software performance is concerned, these are the only differences I could find between the two packages. Generally, the better features of *Writer 64* are the kind you might expect for a six-month upgrade of a product. Files from one are not compatible with the other, but other than that, the two packages seem like versions 1 and 2 of the same word processor. Both are priced at $39.95.

One of Timeworks' claims of superiority is in its documentation. It does have a slightly thicker manual (the manual that comes with *Word Publisher* is very thin and unimpressive) that features an index and a troubleshooting guide, which is lacking in the competition.

Clearly, no one will want to buy both of these word processors. Writers who value speed over *geoWrite*'s WYSIWYG interface would be wise to take a look at *Writer 64*. If they already own *Word Publisher*, they would be smarter to hold on to their money.

Writer 64
Timeworks
444 Lake Cook Rd.
Deerfield, IL 60015
$39.95

Word Publisher
Spinnaker
One Kendall Sq.
Cambridge, MA 02139
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G

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* Back issues of *COMPUTE!*, and *COMPUTE!'s Gazette* are $6.00 each. No issues dated prior to January, 1986, are available. In addition, the following issues are **NOT** available: ***Gazette:*** 1/86, 3/86.

* Single disks for *COMPUTE!'s Gazette* are $15.00. Disk/magazine combinations are $16.00 NOTE: No disks dated prior to June 1986 are available. The May 1986 and October, 1987 *Gazette* disks are no longer available.

* Back issues of *COMPUTE!'s PC Magazine* are $16.00 each. This publication is available only as a magazine/disk combination. Our back issue inventory consists mainly of magazines with 5.25-inch disks, but we will attempt to supply 3.5-inch disks if requested. The following issues are **NOT** available: ***PC Magazine:*** 9/87, 11/87, 9/88.

* Back issues of *COMPUTE!'s Amiga Resouce* magazine are available beginning with Spring, 1989 for $6.00 each. Back issues of *COMPUTE'S Amiga Resource Disk* are available beginning with Summer, 1989 for $10.00 each. Disk/magazine combinations are $12.00.

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User Group Update

Compiled by Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1989 issues.

Send typed additions, corrections, and deletions for this list to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Note: COMPUTE! Publications does not condone the use of its user group lists by individuals or user groups for the purpose of buying, selling, or trading pirated software. Should we discover a group participating in any such illegal and unethical activity, that club's listing will be permanently deleted from our files.

User Group Notes

In "A Guide to Commodore User Groups, Part 2" (June), the **Dayton Area Commodore Users Group (DACUG)** was listed twice. Both addresses are correct, but the club prefers to receive mail at 1117 Lavern Avenue, Kettering, Ohio 45429.

The **North Valley Commodore Users Group (NVCUG)** (P.O. Box 7658, Chico, California 95927) has a new bulletin board service. The telephone number is (916) 894-8333.

The bulletin board service number for the **Southern Maine Commodore User Group** (P.O. Box 416, Scarborough, Maine 04074-0416) is (207) 967-3719.

The **Commodore Users Group of Cape Cod** has a new address. All correspondence should be sent to 149 Hayway Road, East Falmouth, Massachusetts 02536.

An incorrect address was published in the May guide to Commodore user groups for the **Computer Owners of Marysville, Port Huron.** The correct address is 2937 West Woodland Drive, Port Huron, Michigan 48060 (BBS# 313-364-6489).

The **Central New York Commodore Users Group (CNYCUG)** has changed its address. The club's new address is P.O. Box 397, Syracuse, New York 13209.

Readers interested in corresponding with the **Scranton Commodore Users Group (S.C.U.G.)** should note that its address has changed to P.O. Box 244, Scranton, Pennsylvania 18501-0244.

New Listings

CALIFORNIA

C128 West Commodore 128 User Group, 17047 Devanah St., Covina, CA 91722 (BBS# 714-923-1031)

Orange County Commodore Club, 21602 Brookhurst St., Apt. D, Huntington Beach, CA 92646

HAWAII

Commodore Hawaii Users Group (CHUG), P.O. Box 23260, Honolulu, HI 96822

IOWA

Plymouth County Commodore User's Group (PLYCCUG), 508 1st St. SW, Le Mars, IA 51031

MARYLAND

Annapolis Commodore User's Group, P.O. Box 3358, Annapolis, MD 21403

MISSISSIPPI

Coastline Commodore Computer Club, Inc., P.O. Box 114, Biloxi, MS 39533 (BBS# 601-374-2582)

NEW YORK

Boyette's Big Apple Commodore Users Group for 64 Owners, 2052 69th St., Brooklyn, NY 11204

WEST VIRGINIA

Commodore Order of Renegade Programmers (The CORP), 911 Belvedere Dr., Charles Town, WV 25414

Outside the U.S.

AUSTRALIA

Commodore Computer Users Group (QLD) Inc., P.O. Box 274, Springwood Qld., 4127, Brisbane, Australia

CANADA

Cariboo Commodore 64 Club, c/o Nick Sardy, P.O. Box 634, 150 Mile House, B.C., Canada V0K 2G0

ITALY

Active Int., c/o Dr. Wizak J. P. Cecio, Via B. Zumbini, No. 27, Flat #34/Pal. 3, 80055 Portici City, Italy

MEXICO

HACKS, Barcazas #115, 86100, Villahermosa, Tabasco, Mexico

Pad Users Group, 216 Sexta Avenida, Colonia Cubres, Monterrey, Nuevo Leon, Mexico 64610

PAKISTAN

Computer Users of Pakistan, 882/14, Federal B' Area, Karachi-38, Pakistan

The Hacker's Club, 24-A, Model Town, Lahore—54700, Pakistan (no return postage required)

THAILAND

The Infinite Commodore User Group, c/o Suraj Gulrajani, 23/10 Soi 10 Sukhumvit Rd., Bangkok, Thailand 10110 G

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Note: Only selected titles are listed in contents for each issue

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February—Lexitron, Snapshot, 128 Memory Map, Disk Editor, Custom Labels
April—Turbo Copy, CP/M on the 128, Directory Filer, 128 Windows, Input Windows
June—Solarpix, Quick Key, Fontmaker, Help Screens, 64 AutoBoot Maker
July—Saloon Shootout, Budget Planner, Math Worksheet, Sound Designer 128, CP/M Public Domain Software
September—Ultrafont +, Video Jigsaw, Window Wizard, Fast File Copier, 80-Column Character Editor, DOS Window
October—Pig$ for Buck$, Ringside Karate, Menu System, 128 Sound & Music (Pt. 1)
November—Fill-64, 128 Keywords, 1526 Underliner, Turbo Format, 128 Sound & Music (Pt. 2)

1987

January—Keyword Construction Set, One-Touch Function Key, GEOS Icon Changer, CP/M: Surviving with 40 Columns
February—Collision Course, Division Worksheet, MetaBASIC 64, MetaBASIC 128, 128 DOS Wedge, 128 Sound & Music (Pt. 4)
March—Ringside Boxing, Color Craft, 128 RAM Expansion, CP/M RAM Expansion, Sprite Manager
April—Omicron, Music Improvisor, *Print Shop* to GEOS, TurboSave 128, TurboSave 64, Countdown Timer
May—*SpeedScript* 3.0, Powerball, Cassette Sleeve Maker, No-SYS Loader, Fast Boot, Gameports
June—Bingo, Fraction Practice, Free-Form Filer, Disk Vacuum, Hi-Res Graphics on the 128
July—Basketball Sam & Ed, Calendar Maker, Crash Prevention, 128 Graph Designer, GEOS File Storage, Text Framer
August—Bounty Hunter, Sprite Magic, Sprite Stamp, 80-Column Sector Editor (128), Relative Files
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November—Litterbug, Sketch Pad, Poster Printer, Renumber 64, Accessing the 128's 80-Column Screen
December—Crossroads, Snake Pit, Word Find, Animal Match, Disk Rapid Transit, PrintScreen, GeoTrash Restorer

1988

January—How to Buy a Modem, Buyer's Guide to Modems, Needlework Graphics Editor, Tile Paint, Sound Manager
February—Buyer's Guide to Graphics Programs, Easy Load, Turbo *SpeedScript*, Fast 64 Mode for the 128
March—CP/M Software for the 128 (Pt. 1), XPressCard 128, ML Cloner, Big Screen, Color Lister
April—CP/M Software for the 128 (Pt. 2), 3-D Speedway, SpeedFile 64, Ramdisk 128, Mirrors
May—Networking the 64, Guide to User Groups (Pt. 1), Treasure Diver, MOBMaker, 128 Math Graphics, 1541 Speed & Alignment Tester
June—Buyer's Guide to Printers, Guide to User Groups (Pt. 2), Arcade Volleyball, Excelfont-80 (128), Graphics Wedge
July—Hard Disk Drives for the 64/128, Civil War on Disk, Quick Save, Error Analyzer, SYS Stamper
August—MIDI Made Simple, Buyer's Guide to Music Software, Cribbage (128), 128 Shell Booter, 3-D Sprites, Zoom
September—Write All About It! (desktop publishing), Pattern Fill, Multicolor Graphics Dump, SpeedCheck 128, Disk Package, MultiSort 128
October—Commodore Goes Back to School, Buyer's Guide to Preschool Software, Scorpion II, 64 Compressor, SpeedPrint, Speed Columns, 128 Text Sorter
November—GEOS 2.0: A Major Upgrade, Buyer's Guide to Word Processors and Spelling Checkers, Rally Racer, Block Out (128), Sprite Killer, Notepad 64, Font Grabber (GEOS)
December—88's Best Games, Ringside LXIV!, Crossroads II, Digi-Sound, Dynamic Windows, Quick! (1541 speedup), 1526 PrintScreen, Key Lock

1989

January—Guided Tour of Major Online Services, How to Get Published, Disc Blitz, Jewel Grab, 128 Animator, Smooth-Scrolling Windows, Handy Filer, Smart Disassembler
February—Around the World with Commodore, Buyer's Guide to Personal Publishing Software, Tank Ambush, Gridloc (128), The Great Arcade Machine, 1581 Alphabetizer, Sound Wedge
March—Dream to Reality: Simulation Designers Speak Out, Buyer's Guide to Sports Games and Simulations, The Anglers, Bacteria (128), Planebender, Bitmap Buster, Monthly Calendar, MultiView
April—Designing Your Own Programs, Buyer's Guide to Programming Aids, Science Fiction on Disk, Space Worms, BASIC 10, File Saver (GEOS), Super Accelerator (128), Comparator
May—Care and Feeding of Dot-Matrix Printers, Fantasy on Disk, Guide to User Groups (Pt. 1), Knock 31, Hi-Res Windows, RAM Wedge 128, Super Slideshow, Quick Print, Close-up: GEOS 128 2.0
June—Best Arcade Sports Games, Guide to User Groups (Pt. 2), Match Mania, Jericho II, Hi-Res 80 (128), SpeedCount, MacroBASIC (64/128), Grafix Converter, GEOS Help Pad
July—Speakers, Stereo, and MIDI Solutions; Mine Sweeper, Monster Bar-B-Q (128), Math Magic, CHR$ Graphics, Financial Planner, 1581 Directory Sorter, GEOS File Retriever

FOR ORDER INFORMATION AND FORM, SEE PAGE 63.
Corresponding monthly disks are available only for issues from January 1986 forward.

MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

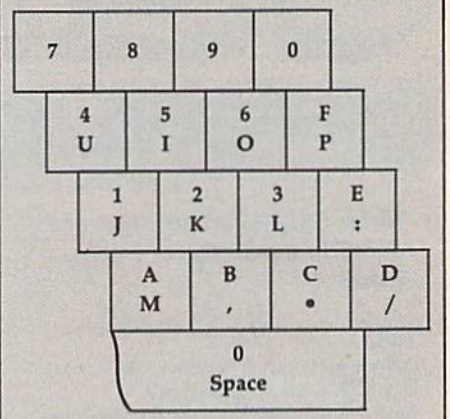
Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

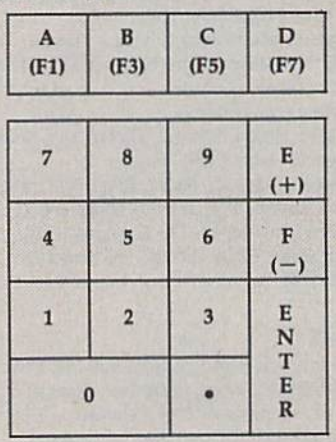
Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485–487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

64 MLX Keypad



128 MLX Keypad



Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk (DLOAD *"filename"* on the 128) or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX for Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP–RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

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```
      RESS[4]";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
      [4]";:GOSUB300:IF IN$<>
      N$ THEN GOSUB1030:IF F
      {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
      {SPACE}":GOSUB400:IF IN
      $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
       THEN PRINT IN$:PRINT"
      {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
      =S$:FOR J=1 TO 2:IF F T
      HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
      24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
      $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
      3*(A$=".")-4*(A$="/")-5
      *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
      ")-9*(A$="U")-10*(A$="I
      ")-11*(A$="O")-12*(A$="
      P")
CM 487 A=A-13*(A$=S$):IF A THE
      N A$=MID$("ABCD123E456F
      0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
      =1)OR F)THEN PRINT B$;:
      J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
      NT B$:J=2:NEXT:I=24:NEX
      T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
      ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
      ((I=0)AND(J=1))THEN GOS
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF(
      I<>B)AND ST THEN F=2:AD
      =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
XP 950 POKE147,0:SYS 63562:IF
      {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
```

```
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

Program 2: MLX for Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
       DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
       ):DL$=CHR$(20):SP$=CHR$
       (32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
       DEF FNLB(A)=A-FNHB(A)*2
       56:DEF FNAD(A)=PEEK(A)+
       256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
        5,"C":KEY 7,"D":VOL 15
       :IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
       HR$(8):COLOR 0,15:COLOR
        4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
       {RVS}{2 SPACES}{9 @}
       {2 SPACES}"RT$;TAB(12)"
       {RVS}{2 SPACES}{OFF}
       {BLU} 128 MLX {RED}
       {RVS}{2 SPACES}"RT$;TAB
       (12)"{RVS}{13 SPACES}
       {BLU}"
FE 170 PRINT"{2 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
       RESS{4}";:GOSUB 260:IF
       {SPACE}AD THEN SA=AD:EL
       SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}";:GOSUB
        260:IF AD THEN EA=AD:E
       LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]?
       {4}":GETKEY A$:IF A$<>"
       Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
       G...";:BANK 0:FOR A=BS
       {SPACE}TO BS+(EA-SA)+7:
       POKE A,0:NEXT A:PRINT"D
       ONE"
DC 220 PRINT TAB(10)"{DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {4}{DOWN}":
       PRINT TAB(13)"{RVS}E
       {OFF}NTER DATA"RT$;TAB(
       13)"{RVS}D{OFF}ISPLAY D
       ATA"RT$;TAB(13)"{RVS}L
       {OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}Q
       {OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
       CQ",A$):ON A GOTO 340,5
       50,640,650,930,940:GOSU
       B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
       UB 260:IF(AD<>0)OR(A$=N
       L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
       A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
       $<>NL$ THEN 300:ELSE RE
       TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
       {SPACE}300
PM 290 IF AD>511 AND AD<65280
       {SPACE}THEN PRINT BE$;:
       RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
       NVALID ADDRESS {DOWN}
       {BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
       {SPACE}DATA ":GOSUB 250
       :IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
       ,3
BR 360 GOSUB 310:PRINT HEX$(AD
       )+":";:IF F THEN PRINT
       {SPACE}L$:PRINT"{UP}
       {5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
       =SP$:FOR J=1 TO 2:IF F
       {SPACE}THEN B$=MID$(L$,
       I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
       {SPACE}I<24 THEN PRINT"
       {OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
       D A$<":") OR(A$>"@" AND
        A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
       OTO 470
QB 410 IF A$="-" THEN A$="F":G
       OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
       D (J=1) OR F) THEN PRIN
       T B$;:J=2:NEXT:I=24:GOT
       O 480
RD 430 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
        THEN PRINT B$+LF$;:GOT
       O 470
JP 450 IF A$<>LF$ AND A$<>DL$
       {SPACE}OR ((I=0) AND (J
       =1)) THEN GOSUB 950:GOT
       O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
       +LF$;:J=2-J:IF J THEN P
       RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
       {SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
       T#3,A$,B$:IF A$=SP$ THE
       N I=25:NEXT:CLOSE 3:GOT
       O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
       (L$,I,2)=A$:IF I<25 THE
       N GOSUB 320:A(I/3)=A:GE
       T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
       SUB 950:PRINT:PRINT"
       {RVS} ERROR: REENTER LI
       NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
       HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
       {BLU}** END OF ENTRY **
       {BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GO
       SUB 250:IF A$=NL$ THEN
       {SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
       {BLU}PRESS: {RVS}SPACE
       {OFF} TO PAUSE, {RVS}RE
       TURN{OFF} TO BREAK{4}
       {DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
       UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
       ):PRINT RIGHT$(HEX$(A),
       2);SP$;:GOSUB 320:NEXT
       {SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
       $(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
       EN PRINT"{BLU}** END OF
        DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
       RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
       INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
       OAD DATA ":OP=1:GOTO 66
       0
BP 650 PRINT BE$"{DOWN}{RVS} S
       AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
       ME{4}";F$:IF F$=NL$ THE
       N 220
PF 665 IF LEN(F$)>14 THEN 660
RF 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}
       ISK: {4}";
SQ 680 GETKEY A$:IF A$="T" THE
       N 850:ELSE IF A$<>"D" T
       HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
       THEN 760
EH 700 DOPEN#1,(F$+",P"),W:IF
       {SPACE}DS THEN A$=D$:GO
       TO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
       A):POKE BS-1,FNHB(SA):P
       RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
       PRINT#1,CHR$(PEEK(A));:
       IF ST THEN A$="DISK WRI
       TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED
       {SPACE}WITHOUT ERRORS *
       *":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N]{4}
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$):PRINT:GOTO 700
       :ELSE PRINT"{BLK}":GOTO
        660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
       "{BLK}{RVS} ERROR DURIN
       G SAVE: {4}":PRINT A$:G
       OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
        THEN A$=DS$:F=4:CLOSE
       {SPACE}1:GOTO 790
```

```
        E SAVE COMPLETED **":GO
        TO 220
CP 890  SYS DEC("E99A"):PRINT:I
        F PEEK(2816)=5 THEN GOS
        UB 950:PRINT"{DOWN}
        {BLK}{RVS} FILE NOT FOU
        ND ":GOTO 220
GQ 900  PRINT"LOADING ...{DOWN}
        ":AD=FNAD(2817):IF AD<>
        SA THEN F=1:GOTO 800:EL
        SE AD=FNAD(2819)-1:F=-2
        *(AD<EA)-3*(AD>EA)
JD 910  A=BS:B=BS+(EA-SA)+1:GOS
        UB 920:SYS DEC("E9FB"):
        IF ST>0 THEN 800:ELSE 7
        90
XB 920  POKE193,FNLB(A):POKE194
        ,FNHB(A):POKE 174,FNLB(
        B):POKE 175,FNHB(B):RET
        URN
CP 930  CATALOG:PRINT"{DOWN}
        {BLU}** PRESS ANY KEY F
        OR MENU **":GETKEY A$:G
        OTO 220
MM 940  PRINT BE$"{RVS} QUIT
        {4}";RT$;"ARE YOU SURE
        {SPACE}{Y/N}?":GETKEY A
        $:IF A$<>"Y" THEN 220:E
        LSE PRINT"{CLR}":BANK 1
        5:END
JE 950  SOUND 1,500,10:RETURN
AF 960  IF ER=14 AND EL=260 THE
        N RESUME 300
MK 970  IF ER=14 AND EL=500 THE
        N RESUME NEXT
KJ 980  IF ER=4 AND EL=780 THEN
         F=4:A$=DS$:RESUME 800
DQ 990  IF ER=30 THEN RESUME:EL
        SE PRINT ERR$(ER);" ERR
        OR IN LINE";EL
PX 770  GET#1,A$,B$:CLOSE 1:AD=
        ASC(A$)+256*ASC(B$):IF
        {SPACE}AD<>SA THEN F=1:
        GOTO 790
KB 780  PRINT"LOADING ";F$:PRIN
        T:BLOAD(F$),B0,P(BS):AD
        =SA+FNAD(174)-BS-1:F=-2
        *(AD<EA)-3*(AD>EA)
RQ 790  IF F THEN 800:ELSE PRIN
        T"{BLU}** LOAD COMPLETE
        D WITHOUT ERRORS **":GO
        TO 220
ER 800  GOSUB 950:PRINT"{BLK}
        {RVS} ERROR DURING LOAD
        : {4}":ON F GOSUB 810,8
        20,830,840:GOTO220
QJ 810  PRINT"INCORRECT STARTIN
        G ADDRESS (";HEX$(AD);"
        )":RETURN
DP 820  PRINT"LOAD ENDED AT ";H
        EX$(AD):RETURN
EB 830  PRINT"TRUNCATED AT ENDI
        NG ADDRESS ("HEX$(EA)")
        ":RETURN
FP 840  PRINT"DISK ERROR ";A$:R
        ETURN
KS 850  PRINT"TAPE":AD=POINTER(
        F$):BANK 1:A=PEEK(AD):A
        L=PEEK(AD+1):AH=PEEK(AD
        +2)
XX 860  BANK 15:SYS DEC("FF68")
        ,0,1:SYS DEC("FFBA"),1,
        1,0:SYS DEC("FFBD"),A,A
        L,AH:SYS DEC("FF90"),12
        8:IF OP THEN 890
FG 870  PRINT:A=SA:B=EA+1:GOSUB
         920:SYS DEC("E919"),3:
        PRINT"SAVING ";F$
AB 880  A=BS:B=BS+(EA-SA)+1:GOS
        UB 920:SYS DEC("EA18"):
        PRINT"{DOWN}{BLU}** TAP
```


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Boomerang

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```
0801:0B 08 00 00 9E 36 33 36 03
0809:35 00 00 00 00 20 0C 10 5C
0811:04 91 35 31 36 38 35 28 66
0819:34 38 97 37 37 30 3C 30 DA
0821:2C 30 04 10 0C 19 04 99 3B
0829:26 01 97 11 15 10 4F 49 61
0831:45 30 37 28 35 38 54 09 95
0839:4F 01 34 30 2C 39 34 0C 75
0841:00 00 0C 00 00 28 00 00 73
0849:CA 00 00 08 C0 00 38 00 B5
0851:00 03 00 00 00 00 00 00 22
0859:00 00 00 00 00 00 00 00 69
0861:00 00 00 00 00 00 00 00 71
0869:00 00 00 00 00 00 00 00 79
0871:00 00 00 00 00 00 00 00 81
0879:00 00 00 00 00 00 00 0C 95
0881:00 00 0C 00 00 0A 00 00 3B
0889:28 C0 00 C8 00 00 0B 00 80
0891:00 30 00 00 00 00 00 00 AD
0899:00 00 00 00 00 00 00 00 A9
08A1:00 00 00 00 00 00 00 00 B1
08A9:00 00 00 00 00 00 00 00 B9
08B1:00 00 00 00 00 00 00 00 C1
08B9:00 00 00 00 00 00 00 3C 06
08C1:00 00 0C 00 00 EA 00 00 FE
08C9:0A C0 00 08 00 00 22 00 D3
08D1:00 C3 00 00 00 00 00 00 D2
08D9:00 00 00 00 00 00 00 00 E9
08E1:00 00 00 00 00 00 00 00 F1
08E9:00 00 00 00 00 00 00 00 F9
08F1:00 00 00 00 00 00 00 00 02
08F9:00 00 00 00 00 00 00 3C 46
0901:00 00 0C 00 00 28 00 00 35
0909:3A 00 00 0B 00 00 22 00 2D
0911:00 30 C0 00 00 00 00 00 47
0919:00 00 00 00 00 00 00 00 2B
0921:00 00 00 00 00 00 00 00 33
0929:00 00 00 00 00 00 00 00 3B
0931:00 00 00 00 00 00 00 00 43
0939:00 00 00 00 00 00 00 0F 5A
0941:00 00 0C 00 00 2A C0 00 FE
0949:E8 00 00 08 00 00 22 00 94
0951:00 30 C0 00 00 00 00 00 87
0959:00 00 00 00 00 00 00 00 6B
0961:00 00 00 00 00 00 00 00 73
0969:00 00 00 00 00 00 00 00 7B
0971:00 00 00 00 00 00 00 00 83
0979:00 00 00 00 00 00 00 0F 9A
0981:00 00 0C 00 00 0A 00 00 3D
0989:2B 00 00 38 00 00 22 00 F8
0991:00 C3 00 00 00 00 00 00 94
0999:00 00 00 00 00 00 00 00 AB
09A1:00 00 00 00 00 00 00 00 B3
09A9:00 00 00 00 00 00 00 00 BB
09B1:00 00 00 00 00 00 00 00 C3
09B9:00 00 00 00 00 00 00 0C D7
09C1:00 00 0C 00 00 08 00 00 75
09C9:2A 00 00 C8 C0 00 08 00 93
09D1:00 3B 00 00 00 00 00 00 B2
09D9:00 00 00 00 00 00 00 00 EB
09E1:00 00 00 00 00 00 00 00 F3
09E9:00 00 00 00 00 00 00 00 FB
09F1:00 00 00 00 00 00 00 00 04
09F9:00 00 00 00 00 00 00 3C 48
0A01:00 00 0C 00 00 08 00 00 B6
0A09:EA 00 00 0B 00 00 08 00 53
0A11:00 3B 00 00 00 00 00 00 F3
0A19:00 00 00 00 00 00 00 00 2D
0A21:00 00 00 00 00 00 00 00 35
0A29:00 00 00 00 00 00 00 00 3D
0A31:00 00 00 00 00 00 00 00 45
0A39:00 00 00 00 00 00 00 0F 5C
0A41:00 00 0C 00 00 08 00 00 F6
0A49:2A C0 00 38 00 00 08 00 36
0A51:00 3B 00 00 00 00 00 00 34
0A59:00 00 00 00 00 00 00 00 6D
0A61:00 00 00 00 00 00 00 00 75
0A69:00 00 00 00 00 00 00 00 7D
0A71:00 00 00 00 00 00 00 00 85
0A79:00 00 00 00 00 00 00 F0 7E
0A81:00 00 C0 00 00 C0 00 00 B0
0A89:00 00 00 00 00 00 00 00 9D
0A91:00 00 00 00 00 00 00 00 A5
0A99:00 00 00 00 00 00 00 00 AD
0AA1:00 00 00 00 00 00 00 00 B5
0AA9:00 00 00 00 00 00 00 00 BD
0AB1:00 00 00 00 00 00 00 00 C5
0AB9:00 00 00 00 00 00 00 F0 BE
0AC1:00 00 30 00 00 30 00 00 9C
0AC9:00 00 00 00 00 00 00 00 DD
0AD1:00 00 00 00 00 00 00 00 E5
0AD9:00 00 00 00 00 00 00 00 ED
0AE1:00 00 00 00 00 00 00 00 F5
0AE9:00 00 00 00 00 00 00 00 FD
0AF1:00 00 00 00 00 00 00 00 06
0AF9:00 00 00 00 00 00 00 30 3E
0B01:00 00 30 00 00 F0 00 00 E0
0B09:00 00 00 00 00 00 00 00 1F
0B11:00 00 00 00 00 00 00 00 27
0B19:00 00 00 00 00 00 00 00 2F
0B21:00 00 00 00 00 00 00 00 37
0B29:00 00 00 00 00 00 00 00 3F
0B31:00 00 00 00 00 00 00 00 47
0B39:00 00 00 00 00 00 00 C0 10
0B41:00 00 C0 00 00 F0 00 00 33
0B49:00 00 00 00 00 00 00 00 5F
0B51:00 00 00 00 00 00 00 00 67
0B59:00 00 00 00 00 00 00 00 6F
0B61:00 00 00 00 00 00 00 00 77
0B69:00 00 00 00 00 00 00 00 7F
0B71:00 00 00 00 00 00 00 00 87
0B79:00 00 00 00 00 00 00 20 AF
0B81:01 20 10 08 00 00 00 00 A2
0B89:21 22 23 24 25 26 27 27 96
0B91:28 29 2A 2B 2C 2D 00 00 14
0B99:00 00 00 00 00 00 00 00 AF
0BA1:00 00 00 00 00 09 00 00 ED
0BA9:00 12 20 20 20 9D 00 12 D3
0BB1:20 20 20 20 20 9D 00 12 6F
0BB9:20 20 20 20 9D 00 1D 1D 32
0BC1:00 1D 1D 1D 1D 00 1D 1D D4
0BC9:1D 00 12 20 11 9D 20 11 03
0BD1:9D 20 9D 00 12 20 11 9D 43
0BD9:20 11 9D 20 11 9D 20 11 4A
0BE1:9D 20 9D 00 12 20 11 9D 53
0BE9:20 11 9D 20 11 9D 20 91 DA
0BF1:91 91 91 91 91 91 91 08
0BF9:91 91 91 91 91 91 91 10
0C01:91 91 91 91 1D 1D 1D 00 29
0C09:11 11 00 11 11 11 11 00 ED
0C11:91 91 91 91 91 91 91 91 29
0C19:91 91 91 91 91 91 91 31
0C21:91 91 1D 1D 1D 1D 00 13 4C
0C29:12 1F 20 20 C2 4C 55 45 4F
0C31:20 2D 20 49 53 20 54 48 49
0C39:49 53 20 4D 41 5A 45 20 C1
0C41:41 43 43 45 50 54 41 42 20
0C49:4C 45 3F 20 00 13 12 1C 4F
0C51:20 20 D2 45 44 20 2D 20 4D
0C59:49 53 20 54 48 49 53 20 62
0C61:4D 41 5A 45 20 41 43 43 DF
0C69:45 50 54 41 42 4C 45 3F E3
0C71:20 00 D9 45 53 20 9D 9D 1D
0C79:9D 9D 00 CE 4F 20 20 9D 8D
0C81:9D 9D 9D 00 12 13 99 20 B3
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0F61:20 01 12 B9 00 D0 C9 FC 81
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1959:0A 8D A6 0B 8D A7 0B A9 44
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1969:FF 20 89 12 A9 79 A0 0D 77
1971:20 1E AB A9 01 8D 81 0B 97
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1991:A0 0B 29 10 F0 3C 4C 7C 8A
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1A29:F8 07 8D F9 07 AD 96 0B 14
1A31:8D FA 07 8D FB 07 A9 0A FD
1A39:8D 10 D0 A9 20 8D 00 D0 F4
1A41:A9 9B 8D 01 D0 A9 44 8D 36
1A49:02 D0 A9 8B 8D 03 D0 A9 64
1A51:20 8D 04 D0 A9 8F 8D 05 32
1A59:D0 A9 48 8D 06 D0 A9 9B A4
1A61:8D 07 D0 A9 0F 8D 15 D0 7C
1A69:A9 01 8D 01 D4 A9 FA 8D 45
1A71:06 D4 A9 51 8D 04 D4 A9 F7
1A79:0D 20 E8 13 A9 85 A0 0C 3B
1A81:20 1E AB A2 00 A0 00 CE 3E
1A89:27 D0 CE 28 D0 88 D0 F7 24
1A91:8E 00 D4 E8 D0 F1 A9 50 28
1A99:8D 04 D4 A9 00 20 E8 13 30
1AA1:A9 A7 A0 0C 20 1E AB A9 E3
1AA9:00 AE A6 0B CA 20 CD BD 3F
1AB1:A9 B5 A0 0C 20 1E AB A9 77
1AB9:00 AE A7 0B CA 20 CD BD 6F
1AC1:A9 D1 A0 0C 20 1E AB 20 05
1AC9:EA 11 20 14 12 20 37 12 8E
1AD1:20 8D 14 A9 01 8D 98 0B 11
1AD9:A9 FE 8D 99 0B A9 04 8D 82
1AE1:9A 0B A9 FB 8D 9B 0B A9 B5
1AE9:00 20 C6 0D A9 02 8D 98 D8
1AF1:0B A9 FD 8D 99 0B A9 08 03
1AF9:8D 9A 0B A9 F7 8D 9B 0B CF
1B01:A9 01 20 C6 0D A9 04 8D 61
1B09:98 0B A9 FB 8D 99 0B A9 D5
1B11:00 20 32 15 A9 00 20 32 A6
1B19:15 A9 08 8D 98 0B A9 F7 5A
1B21:8D 99 0B A9 01 20 32 15 82
1B29:A9 01 20 32 15 20 C4 16 64
1B31:20 2A 17 20 90 17 20 EC F4
1B39:17 20 E4 FF C9 51 F0 3A 4F
1B41:AD A9 0B D0 0B AD A8 0B 92
1B49:F0 03 4C 06 1A 4C C8 1A 50
1B51:AD A6 0B F0 0F A9 06 20 C3
1B59:E8 13 A9 D4 A0 0C 20 1E DE
1B61:AB 4C 71 1B A9 02 20 E8 DE
1B69:13 A9 FB A0 0C 20 1E AB E5
1B71:AD 01 DC 2D 00 DC 29 10 03
1B79:D0 F6 20 F6 11 A9 00 20 98
1B81:E8 13 A9 56 A0 0D 20 1E 23
1B89:AB 20 EF 14 F0 03 4C 55 5E
1B91:19 A9 93 20 D2 FF A9 9A B7
1B99:20 D2 FF A9 09 20 D2 FF 9D
1BA1:A9 8E 20 D2 FF A9 06 8D C1
1BA9:21 D0 A9 0E 8D 20 D0 A9 F2
1BB1:00 8D 15 D0 85 C6 8D 18 75
1BB9:D4 60 00 00 00 00 00 00 72
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Stars II

Article on page 32.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
EK 20 DIMMC(12):FORJF=1TO12:RE
      ADMC(JF):NEXT
QC 30 POKE53280,6:POKE53281,15
      :PRINT"{4}"
EK 40 POKE 55,0:POKE 56,76:RD=
      ↑/180:SM$(0)="OFF":SM$(1
      )="ON(PRESS S TO STOP)"
PR 50 LT=40:LG=75:TZ=5:YY=1990
      :MM=1:DD=1:LA=LT*RD:AH=1
      0:AP$="PM"
JA 60 PRINT"{CLR}";:PRINTTAB(1
      4) "{RVS} STARS II {OFF}
      ":PRINT
MG 70 PRINTTAB(12)"COPYRIGHT 1
      989":PRINTTAB(7)"COMPUTE
      ! PUBLICATIONS, INC."
AX 80 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":PRINT:P
      RINT
BB 90 PRINTTAB(8)"{RVS}PLEASE
      {SPACE}WAIT 40 SECONDS
      {OFF}"
BS 100 FORI=0TO7:READDF$(I):NE
       XT
GM 110 FOR I=1TO33:READA:POKE4
       9151+I,A:NEXT
GD 120 POKE56334,PEEK(56334)AN
       D254:POKE1,PEEK(1)AND25
       1
BP 130 SYS49152:POKE1,PEEK(1)O
       R4:POKE56334,PEEK(56334
       )OR1
CR 140 DEF FNAC(X)=(ATN(ABS(SQ
       R(1-X*X)/X))+(SGN(X)-1)
       *↑/2)*SGN(X)
AS 150 DEF FNAS(X)=ATN(ABS(X)/
       (SQR(1-X*X)))*SGN(X)
BF 160 FOR I=0TO5:READ P$(I),P
       S(I),TP(I),E(I),W(I),EC
       (I),A(I),I(I),O(I),T0(I
       ):NEXT
CD 170 FOR I=1TO4:READPO(I),DI
       (I):NEXT:GOSUB980
HR 180 FORI=0TO3:A%(I)=PEEK(63
       +I):NEXT:GOSUB1680
BS 190 PRINT"{CLR}{RVS} STARS
       {SPACE}II {OFF}":GOSUB1
       230:PRINT"{DOWN}{RVS} M
       ENU {OFF}"
JS 200 PRINT"{DOWN}1 - OVERHEA
       D SKY PLOT"
RJ 210 PRINT"2 - EASTERN HORIZ
       ON PLOT"
HD 220 PRINT"3 - SOUTHERN HORI
       ZON PLOT"
GR 230 PRINT"4 - WESTERN HORIZ
       ON PLOT"
HB 240 PRINT"5 - SOLAR SYSTEM
       {SPACE}DATA"
RK 250 PRINT"6 - SET DATE & TI
       ME"
SH 260 PRINT"7 - TRAVEL"
PG 270 PRINT"8 - CONSTELLATION
       S"
GS 280 PRINT"9 - SIMULATION MO
       DE: ";SM$(SM)
MD 290 PRINT"Q - QUIT"
AK 300 POKE198,0:WAIT198,1:GET
       A$:QM=VAL(A$):IFA$="Q"T
       HENPRINT"{CLR}":END
QH 310 POKE53280,6:IFQM>9ORQM=
       0THEN300
GR 320 DF$="E":DF=0:DQ=1:J=0:O
       NQMGOTO350,350,330,340,
       370,400,410,470,520
MJ 330 DF$="S":DF=↑/2:DQ=3:GOT
       O350
KR 340 DF$="W":DF=↑:DQ=5
DC 350 GOSUB700:GOSUB1080:GOSU
       B760:IFA$="S"THEN650
QP 360 GOTO530
BB 370 POKE53280,6:PRINT"{CLR}
       {RVS} THE SKY {OFF}":GO
       SUB1230
RP 380 PRINT"{DOWN} SIDEREAL T
       IME="INT(TS)"HRS"INT((T
       S-INT(TS))*60)"MIN"
QB 390 GOSUB700:GOSUB760:GOSUB
       680:GOTO190
PP 400 GOSUB1680:GOTO190
KG 410 INPUT"{CLR}LATITUDE=";L
       T:IFABS(LT)>89.9THENLT=
       89.9*SGN(LT)
MX 420 LA=LT*RD:PRINT"CHANGE L
       ONGITUDE (Y/N)? "
HG 430 POKE198,0:WAIT198,1:GET
       A$:IFA$="Y"THEN450
MB 440 GOTO190
```

```
RJ 450 INPUT"LONGITUDE=";LG
AP 460 INPUT"TIME ZONE (EST=5
       {SPACE}CST=6 MST=7 PST=
       8):";TZ:GOSUB2000:GOTO1
       90
KC 470 POKE53280,6:PRINT"{RVS}
       {CLR}CONSTELLATION LIST
       "
KH 480 READRA:IFRA>0THENREADDC
       ,MG:GOTO480
FD 490 J=J+1:READLB$:IFLB$="EN
       D"THENGOSUB690:GOSUB680
       :GOTO190
JB 500 READA$:PRINTLB$TAB(12)A
       $:IFJ<20THEN480
EQ 510 GOSUB680:J=0:GOTO470
PX 520 SM=1-SM:HD=0:AT$="S":T$
       ="":GOTO190
HE 530 GETA$:IFA$="S"THEN650
EC 540 READRA:IFRA>0THEN570
BM 550 READLB$:IFLB$="END"THEN
       610
QP 560 READA$:X=907:BH=0:GOSUB
       1390:GOSUB1420:GOTO530
QX 570 READDC,MG:IFBH=1THENMG=
       5:GOTO530
AA 580 GOSUB2160:IFAL<0THENMG=
       5:BH=1:GOTO530
PP 590 GOSUB1480:IFX>0THENGOSU
       B1300
GK 600 GOTO530
HG 610 IFSM=0THEN640
FH 620 MM=MM+1:IFMM=13THENMM=1
       :YY=YY+1
QA 630 GOSUB690:GOSUB2000:GOTO
       350
SJ 640 LB$="PRESS RETURN":X=90
       7:GOSUB1420:POKE198,0:W
       AIT198,1
MP 650 GOSUB690:SM=0
HE 660 POKE53272,20:POKE56576,
       3:POKE53265,PEEK(53265)
       AND223:POKE648,4:POKE53
       280,6
DB 670 GOTO190
QP 680 PRINT"{DOWN}{RVS}PRESS
       {SPACE}ANY KEY":POKE198
       ,0:WAIT198,1:RETURN
BP 690 FORI=0TO3:POKE63+I,A%(I
       ):NEXT:RETURN
FP 700 MD=2*↑/365.2422*DA-.065
       6743:GOSUB1560
GJ 710 MD=MD+2*EC(0)*SIN(MD)+4
       .9322377:GOSUB1560
PR 720 L=MD:B=0:GOSUB1610:GOSU
       B2160
DB 730 BG=0:IF(AL/RD)>-10THENB
       G=6
BP 740 IF(AL/RD)>0 THEN BG=14
KE 750 RETURN
JP 760 PRINTTAB(8)"{DOWN}{RVS}
        ALT{13 SPACES}DISTANCE
       {2 SPACES}"
KC 770 PRINTTAB(8)"{RVS}(DEG)
       {3 SPACES}VIEW
       {3 SPACES}(MILLION MI)"
KP 780 K=0:GOSUB1390:LB$="SUN"
       :X=907:BH=0:GOSUB1420:G
       OSUB1210
EM 790 GOSUB1480:GOSUB1370
KH 800 GOSUB950:LE=LP:RE=RP:PR
       INTTAB(25)INT(RP*930)/1
       0
DF 810 FOR K=1 TO 5:GETA$:IFA$
       ="S"THENRETURN
QR 820 GOSUB950:PSI=FNAS(SIN(L
       P-O(K))*SIN(I(K)))
QQ 830 Y=SIN(LP-O(K))*COS(I(K)
       ):X=COS(LP-O(K))
XB 840 GOSUB1640:L1=O(K)+R0:R1
       =RP*COS(PSI):IFK>2THEN8
       80
DF 850 A1=ATN((R1*SIN(LE-L1))/
       (RE-R1*COS(LE-L1)))
DX 860 MD=(↑+LE+A1):GOSUB1560:
       L=MD
KQ 870 B=ATN(R1*TAN(PSI)*SIN(L
       -L1)/(RE*SIN(L1-LE))):G
       OTO900
MX 880 MD=ATN(RE*SIN(L1-LE)/(R
       1-RE*COS(L1-LE)))+L1:GO
       SUB1560:L=MD
AS 890 B=ATN(R1*TAN(PSI)*SIN(L
       -L1)/(RE*SIN(L1-LE)))
RS 900 GOSUB1610:GOSUB2160:GOS
       UB1210
QE 910 LB$=P$(K):X=907:BH=0:GO
       SUB1390:GOSUB1420
JC 920 DP=SQR(RE*RE+RP*RP-2*RE
       *RP*COS(LP-LE))
AG 930 PRINTTAB(25)INT(DP*93)
EF 940 GOSUB1480:GOSUB1370:NEX
       T:RETURN
HG 950 MD=360/365.2422*DA/TP(K
       )*RD:GOSUB1560:NP=MD
AQ 960 MD=NP+2*EC(K)*SIN(NP+E(
       K)-W(K))+E(K):GOSUB1560
       :LP=MD
DA 970 RP=A(K)*(1-EC(K)*EC(K))
       /(1+EC(K)*COS(LP-W(K)))
       :RETURN
PD 980 S8=32769:L8=8191:N6=327
       68:POKE40959,0:GOSUB144
       0:AD=N6
FG 990 FOR I=1TO180STEP2:X0=12
       7*SIN(2*I*RD)+127:Y0=10
       0*COS(2*I*RD)+100
GB 1000 GOSUB1270:NEXT
PA 1010 FORJ=1TO4:X=PO(J):Y=DI
       (J):GOSUB1430:NEXT:Q1=
       72:Q2=192:GOSUB1050
AF 1020 GOSUB1070:FORI=0TO39:X
       =760+I:Y=512:GOSUB1430
       :NEXT
XP 1030 Q1=880:Q2=888:GOSUB105
       0
BF 1040 S8=30576:L8=2047:N6=19
       456:GOSUB1440:RETURN
ER 1050 FORI=0TO5:J=INT(I/3):X
       =Q1*(1-J)+Q2*J+(I-3*J)
       *40
JB 1060 Y=PS(I):GOSUB1430:LB$=
       P$(I):X=X+1:GOSUB1420:
       NEXT:RETURN
KP 1070 S8=24577:L8=8191:N6=24
       576:POKE32767,0:GOSUB1
       440:AD=N6:RETURN
QJ 1080 POKE53280,BG:AD=24576:
       S8=23553:L8=1001:N6=23
       552:POKE24553,BG+16:GO
       SUB1440
BE 1090 IFQM=1THENS8=32768:L8=
       8191:N6=AD:GOSUB1440:G
       OTO1120
GG 1100 GOSUB1070:S8=19456:L8=
       2047:N6=30576:GOSUB144
       0
KQ 1110 FORI=0TO2:LB$=DF$(I+DQ
       ):X=809+I*10:GOSUB1420
       :NEXT
CM 1120 POKE53265,PEEK(53265)O
       R32:POKE53272,120:POKE
       56576,2:AD=24576
BH 1130 X=947:LB$=STR$(MM):GOS
       UB1400
HP 1140 X=949:Y=376:GOSUB1430
DX 1150 X=951:LB$=STR$(DD):GOS
       UB1400
DJ 1160 X=953:Y=376:GOSUB1430
QJ 1170 X=955:LB$=STR$(YY):GOS
       UB1400
DC 1180 X=987:LB$=STR$(AH):GOS
       UB1400:X=989:Y=464:GOS
       UB1430
FE 1190 X=990:LB$=STR$(INT(AN)
       ):IFLEN(LB$)=2THENLB$=
       " 0"+RIGHT$(LB$,1)
QC 1200 GOSUB1400:X=993:LB$=AP
       $:GOSUB1420:RETURN
AE 1210 PRINTP$(K);TAB(8);INT(
       AL*180/↑);
HG 1220 PRINTTAB(16);DF$(INT(A
       Z*4/↑));:RETURN
RG 1230 PRINT"{DOWN} LATITUDE=
       "LT;:IFLG<>75THENPRINT
       "{2 SPACES}LONGITUDE"L
       G;
SC 1240 PRINT"{DOWN}":PRINTMM"
       /"DD"/"YY
HB 1250 LB$=STR$(INT(AN)):IFLE
       N(LB$)=2THENLB$=" 0"+R
       IGHT$(LB$,1)
PQ 1260 PRINTAH":"LB$" "AP$;T$
       :RETURN
XQ 1270 XC=INT(X0/8):YR=INT(Y0
       /8):LN=Y0AND7
GJ 1280 PT=AD+YR*320+XC*8+LN:X
       B=7-(X0AND7)
EX 1290 POKEPT,PEEK(PT)OR2↑XB:
       RETURN
FS 1300 ONMGGOTO1310,1340,1350
       ,1350,1360
BC 1310 X0=X:Y0=Y+1:GOSUB1270:
       X0=X+1:Y0=Y:GOSUB1270:
       X0=X+2:Y0=Y:GOSUB1270
AE 1320 X0=X+3:Y0=Y+1:GOSUB127
       0
QD 1330 X0=X+1:Y0=Y+2:GOSUB127
       0:X0=X+2:Y0=Y+2:GOSUB1
       270
GE 1340 X0=X+1:Y0=Y+1:GOSUB127
       0
XF 1350 X0=X+2:Y0=Y+1:GOSUB127
       0
GH 1360 RETURN
XQ 1370 IFX=0THENRETURN
JP 1380 X=INT(Y/8)*40+INT(X/8)
       :Y=PS(K):GOSUB1430:RET
       URN
BD 1390 S8=31833:L8=97:N6=3183
       2:POKES8+L8,0:GOSUB144
       0:RETURN
SG 1400 FORJ=1TOLEN(LB$)-1:Y=(
       VAL(MID$(LB$,J+1,1))+4
       8)*8:GOSUB1430:X=X+1
HD 1410 NEXT:RETURN
MQ 1420 FORJ=1TOLEN(LB$):Y=(AS
       C(MID$(LB$,J,1))-64)*8
       :GOSUB1430:X=X+1:NEXT:
       RETURN
PP 1430 L8=7:S8=21504+ABS(Y):N
       6=AD+X*8:GOSUB1440:RET
       URN
KD 1440 A%=L8/256:B%=N6/256+A%
       :B6=N6+256*(A%-B%)
BB 1450 C%=S8/256+A%:C6=S8+256
       *(A%-C%)
BP 1460 POKE781,A%+1:POKE782,L
       8-256*A%:POKE91,C%:POK
       E90,C6:POKE89,B%:POKE8
       8,B6
SQ 1470 SYS41964:RETURN
GK 1480 X=0:Y=0:IFAL<0THENRETU
       RN
SH 1490 IFQM>1THEN1530
FD 1500 AZ=2*↑-AZ:Q=SIN(↑/4-AL
       /2)/COS(↑/4-AL/2)
HA 1510 X=INT((100*Q*SIN(AZ)+1
       00)*1.27)
BS 1520 Y=99-INT(100*Q*COS(AZ)
       ):RETURN
BJ 1530 IFAL>.85*↑/2THENRETURN
ER 1540 IFAZ<DF OR AZ>DF+↑THEN
       X=0:Y=0:RETURN
QC 1550 X=320*(AZ-DF)/(↑):Y=10
       +146*(.85*↑/2-AL)/(.85
       *↑/2):RETURN
GC 1560 IF MD<4*↑THENMD=MD-INT
       ((MD+2*↑)/2/↑)*2*↑
```

```
RF 1570 IF MD>4*↑THENMD=MD-INT
        ((MD-2*↑)/2/↑)*2*↑
AH 1580 IFMD<0THENMD=MD+2*↑:GO
        TO1580
FF 1590 IFMD=>2*↑THENMD=MD-2*↑
        :GOTO1590
BF 1600 RETURN
AS 1610 EP=.4091:D8=SIN(B)*COS
        (EP)+COS(B)*SIN(EP)*SI
        N(L):DC=FNAS(D8)/RD
HM 1620 Y=SIN(L)*COS(EP)-TAN(B
        )*SIN(EP):X=COS(L):GOS
        UB1640
PB 1630 RA=R0/RD/15:RETURN
CS 1640 R0=ATN(Y/X):IF X>0 AND
         Y<0 THEN R0=R0+2*↑
SA 1650 IF X<0 AND Y>0 THEN R0
        =R0+↑
RB 1660 IF X<0 AND Y<0 THEN R0
        =R0+↑
EP 1670 RETURN
CF 1680 HD=0:AT$="S":T$="":POK
        E53280,6
HQ 1690 PRINT"{CLR}{RVS}YEAR:
        {OFF} ";YY;"{LEFT}";
SJ 1700 YR$=STR$(YY):GOSUB3090
        :YY=VAL(YR$)
EM 1710 PRINT:PRINT"{DOWN}
        {RVS}MONTH (1-12):
        {OFF} ";"{LEFT}";MM;"
        {LEFT}";
XK 1720 YR$=STR$(MM):GOSUB3090
        :MM=VAL(YR$):IFMM>12OR
        MM<1THENPRINT"{LEFT}";
        :GOTO1720
HC 1730 GOSUB3150
RS 1740 PRINT:PRINT"{RVS}DAY:
        {OFF} ";DD;:PRINT"
        {LEFT}";
HP 1750 YR$=STR$(DD):GOSUB3090
        :DD=VAL(YR$):IFDD<1THE
        NPRINT"{LEFT}";:GOTO17
        50
XP 1760 GOSUB3150:IFMM<>2THEN1
        830
CM 1770 IFL1=1THEN1830
XE 1780 IFDD<29THEN1840
QJ 1790 PRINT:PRINT"NOT A LEAP
         YEAR!":GOTO1740
PB 1800 GOSUB3150:IFL1=0ORMM<>
        2THEN1830
KB 1810 IFDD<30THEN1840
BK 1820 PRINT:PRINT"NOT A LEAP
         YEAR!":GOTO1740
RJ 1830 IFDD>MC(MM)THENPRINT"
        {LEFT}";:GOTO1750
JQ 1840 PRINT:IFMM<4ORMM>10THE
        N1890
EX 1850 PRINT"{2 DOWN}{RVS}STA
        NDARD OR DAYLIGHT TIME
         (S OR D) {OFF} ";
FE 1860 GET AT$:IF AT$=""THEN1
        860
AM 1870 IFAT$<>"D"ANDAT$<>"S"T
        HEN1860
MA 1880 PRINTAT$
XR 1890 IFAT$="D"THENHD=1:T$="
         DAYLIGHT TIME"
GG 1900 PRINT"{DOWN}{RVS}HOUR
        {SPACE}(1-12):{OFF} ";
        AH;:PRINT"{LEFT}";
PE 1910 YR$=STR$(AH):GOSUB3090
        :AH=VAL(YR$):IFAH>12OR
        AH=0THENPRINT"{LEFT}";
        :GOTO1910
MK 1920 PRINT:PRINT"{RVS}MINUT
        E (0-59):{OFF} ";AN;:P
        RINT"{LEFT}";
GA 1930 YR$=STR$(AN):GOSUB3090
        :AN=VAL(YR$):IFAN>59TH
        ENPRINT"{LEFT}";:GOTO1
        930
GP 1940 PRINT:PRINT"AM OR PM (
        A OR P):";
PH 1950 GET A$:IF A$=""THEN195
        0
JR 1960 IF A$<>"A"ANDA$<>"P"TH
        EN1950
PQ 1970 PRINT"{CLR}"
GD 1980 PRINT"{CLR}":AP$=A$+"M
        "
CB 1990 IFAH=12ANDAP$="AM"THEN
        AH=0
EK 2000 IFAP$="PM"ANDAH<12THEN
        AH=AH+12
EH 2010 M5=MM:D5=DD:MM=1:DD=0:
        GOSUB2300:T0=((JD+FD)-
        2415020)/36525:MM=M5:D
        D=D5
SG 2020 J0=JD:B0=24-(6.6460656
        +(2400.051262*T0)+(.25
        81*1E-4*T0↑2)-(24*(YY-
        1900)))
AM 2030 GOSUB2300:DY=JD-J0
HX 2040 FD=.5+(AH+AN/60+TZ-HD)
        /24:IFFD>1THENFD=FD-1:
        JD=JD+1
JH 2050 IFAH>12THENAH=AH-12
FF 2060 DA=JD-2444238.5+FD:D3=
        JD-2451545
XF 2070 T1=INT(D3/36525)
GC 2080 T2=(JD-T1*36525-245154
        4.5)/36525
GB 2090 S3=24110.54841+184.812
        866*T1+8640184.812866*
        T2+.093104*T3*T3
JK 2100 S3=(S3-0.0000062*T3*T3
        *T3)/86400:S3=24*(S3-I
        NT(S3)+(FD-.5)*1.00273
        7909)
CD 2110 IF S3<0 THEN S3=S3+24
CF 2120 IF S3>24THEN S3=S3-24
BH 2130 H3=INT(S3):M3=INT(60*(
        S3-H3))
JK 2140 TG=H3+M3/60:TS=TG-LG/1
        5:IFTS<0THENTS=TS+24
PG 2150 RETURN
DR 2160 DC=DC*RD:RA=RA*15*RD
SG 2170 T5=TG*15*RD-RA-LG*RD
FM 2180 S1=SIN(LA)*SIN(DC)+COS
        (LA)*COS(DC)*COS(T5)
AC 2190 C1=1-S1*S1
RB 2200 IFC1>0THENC1=SQR(C1)
SM 2210 IFC1<=0THENAL=SGN(S1)*
        ↑/2:GOTO2230
CK 2220 AL=ATN(S1/C1)
DA 2230 C2=COS(LA)*SIN(DC)-SIN
        (LA)*COS(DC)*COS(T5)
RA 2240 S2=-COS(DC)*SIN(T5)
CJ 2250 IFC2=0THENAZ=SGN(S2)*↑
        /2:GOTO2280
CH 2260 AZ=ATN(S2/C2)
MF 2270 IFC2<0THENAZ=AZ+↑
CG 2280 IFAZ<0THENAZ=AZ+2*↑
EB 2290 RETURN
BP 2300 D1=INT(DD):FD=DD-D1-.5
FE 2310 JD=-INT(7*(INT((MM+9)/
        12)+YY)/4)
PQ 2320 S=SGN(MM-9):A=ABS(MM-9
        )
DS 2330 J1=INT(YY+S*INT(A/7))
MJ 2340 J1=-INT((INT(J1/100)+1
        )*3/4)
XK 2350 JD=JD+INT(275*MM/9)+D1
        +J1+1721029+367*YY
KK 2360 IFFD<0THENFD=FD+1:JD=J
        D-1
XH 2370 DA=JD-2444238.5+FD
XH 2380 RETURN
ER 2390 DATA 31,29,31,30,31,30
        ,31,31,30,31,30,31
FE 2400 DATA"N","NE","E","SE",
        "S","SW","W","NW"
EC 2410 DATA 169,0,133,251,133
        ,253,169,208,133,252,1
        69,84,133,254,162,16,1
        60,0
PC 2420 DATA 177,251,145,253,1
        36,208,249,230,252,230
        ,254,202,208,240,96
SJ 2430 DATA"SUN",648
RE 2440 DATA1.00004,1.7249707,
        1.790645,.016718,1,0,0
        ,0
XC 2450 DATA"MERCURY",720
RK 2460 DATA.24085,4.0368994,1
        .3464205,.2056306,.387
        0986,.12224911,.839401
        67,6.74
KP 2470 DATA"VENUS",664,.61521
PB 2480 DATA6.2087212,2.291435
        4,.0067826,.7233316,.0
        5924407,1.3351725,16.9
        2
BP 2490 DATA"MARS",520,1.88089
FH 2500 DATA2.2044875,5.858910
        1,.0933865,1.5236883,.
        03228512,.8622485,9.36
AK 2510 DATA"JUPITER",696,11.8
        6224
DR 2520 DATA2.5650495,.2445127
        6,.0484658,5.202561,.0
        2276227,1.7497278,196.
        74
DR 2530 DATA"SATURN",728,29.45
        771
SB 2540 DATA2.88541742,1.61731
        63,.0556155,9.554747,.
        04344777,1.980753,165.
        6
MH 2550 DATA 16,112,480,40,976
        ,152,511,184
RH 2560 DATA -2,"POLARIS","THE
         NORTH STAR",2,89,2
AB 2570 DATA -1,"BIG DIPPER","
        OR URSA MAJOR, A LARGE
         BEAR"
EH 2580 DATA 11,57,2,11,63,2,1
        1.8,54,2,12.2,58,3,12.
        9,57,2,13.4,55,2,13.7,
        50,2
FG 2590 DATA-2,"BOOTES","THE H
        ERDSMAN",14.3,19,1,14.
        7,27,2,14.5,38,3
ED 2600 DATA -1,"VIRGO","THE V
        IRGIN",13.4,-11,1,12.6
        ,-1,3,12.9,3,3,13,11,3
QP 2610 DATA -1,"PEGASUS","THE
         WINGED HORSE",0.2,15,
        3,23,14,2,23,28,2,.1,2
        9,2
KF 2620 DATA -1,"AURIGA","THE
        {SPACE}CHARIOT DRIVER"
BJ 2630 DATA 5.2,46,1,5.9,45,2
        ,5.9,37,2,4.9,33,3,5.4
        ,29,2
AR 2640 DATA -1,"ORION","THE H
        UNTER",5.9,8,1,5.4,7,2
        ,5.75,-2,2,5.6,-1,2
RQ 2650 DATA 5.45,0,2,5.6,-5.5
        ,4,5.2,-8.5,1,5.8,-10,
        2
RX 2660 DATA -1,"LYRA","THE LY
        RE",18.6,39,1,-9,"CYGN
        US","THE SWAN"
MH 2670 DATA 20.7,45,1,20.3,40
        ,2,19.7,45,3,20.75,34,
        2,19.5,28,3,19.9,35,4
JS 2680 DATA-1,"ARIES","THE RA
        M",2.1,23.5,2,1.8,21,2
        ,1.77,19,4
HP 2690 DATA-1,"CANIS MAJOR","
        THE BIG DOG"
RM 2700 DATA6.7,-17,1,6.4,-18,
        2,6.9,-29,2,7.2,-26,2,
        7.4,-29,2
ME 2710 DATA-1,"AQUILA","THE E
        AGLE",19.8,9,1,19.7,10
        .5,3,19.9,6.5,4
```

```
MM 2720 DATA19.1,13.5,3,20.1,-
        1,3,19.4,3,3,19.1,-5,3
SH 2730 DATA-1,"SCORPIUS","THE
         SCORPION"
RB 2740 DATA16.5,-26,1,16,-20,
        2,15.9,-22,2,15.9,-26,
        3
JS 2750 DATA17.6,-43,2,16.7,-3
        4,2,17.6,-37,2,16.7,-3
        8,3,17.2,-43,3
JX 2760 DATA-1,"CASSIOPEIA","T
        HE QUEEN"
CQ 2770 DATA1.9,63.5,4,1.4,60,
        3,0.9,60.5,2,0.6,56,2,
        0.1,59,2
MC 2780 DATA-1,"ANDROMEDA","CA
        SSIOPEIA'S DAUGHTER",2
        ,42,2,1.1,35,2,.6,31,3
AG 2790 DATA-1,"TAURUS","THE B
        ULL"
HC 2800 DATA4.6,16,1,5.6,21,3,
        4.3,15.5,4,4.45,19,3,4
        .38,17.3,4,4.45,15.9,4
CC 2810 DATA-1,"CANIS MINOR","
        THE SMALL DOG",7.6,6,1
        ,7.4,9,3
GR 2820 DATA-1,"GEMINI","THE T
        WINS"
CA 2830 DATA7.5,32,1,7.7,28,1,
        6.7,25,3,6.6,16,2,6.3,
        22,3,7.3,22,3
JH 2840 DATA-1,"LEO","THE LION
        "
HA 2850 DATA10.1,12.5,1,10.1,1
        7,3,10.3,20,2,10.3,24,
        3,9.8,26,4,9.7,24,3
SK 2860 DATA 11.2,21,2,11.2,16
        ,3,11.8,15,2
SD 2870 DATA-1,"CANCER","THE C
        RAB",8.7,29,4,8.65,22,
        4,8.7,18.5,4,8.9,12,4
BC 2880 DATA8.25,9.5,4,-1,"LIB
        RA","THE SCALES",15.3,
        -9,2,14.8,-16,3
XG 2890 DATA15.5,-14.5,4,15,-2
        5,3
MG 2900 DATA-1,"SAGITTARIUS","
        THE ARCHER"
KF 2910 DATA18.3,-30,3,18,-30.
        5,3,18.4,-25,3,18.9,-2
        6,2,19,-30,2
QC 2920 DATA 18.7,-27,3,19.1,-
        28,3,18.3,-34.5,2
PQ 2930 DATA-1,"CAPRICORN","TH
        E SEA GOAT",20.3,-15,3
        ,20.8,-27,4,21.7,-17,3
KE 2940 DATA21.4,-22,4,21,-18,
        4
MQ 2950 DATA-1,"PISCES","THE F
        ISH",23.2,3,4,23.4,6.5
        ,4,23.6,5.5,4
JJ 2960 DATA23.66,1.5,4,23.4,0
        ,4
EM 2970 DATA-1,"PISCES AUST","
        THE SOUTHERN FISH",22.
        9,-30,1
CE 2980 DATA-1,"AQUARIUS","THE
         WATER BEARER"
RJ 2990 DATA22.6,-.5,3,22.5,-.
        5,3,22.4,1.3,4,22.35,-
        2,4,22.05,-.5,3,21.5,-
        6,3
GF 3000 DATA-1,"CARINA","THE B
        OAT KEEL",6.4,-52,1
BS 3010 DATA8.4,-59,2,9.2,-59,
        2,9.2,-69,2,9.8,-65,3
KK 3020 DATA-1,"VELA","THE SAI
        L"
HG 3030 DATA8.2,-47,2,8.6,-54,
        2,9.1,-43,2,9.3,-55,2,
        10.7,-49,3
RJ 3040 DATA-1,"CRUX","THE SOU
        THERN CROSS"
DC 3050 DATA12.2,-58,2,12.3,-6
        3,2,12.5,-57,2,12.8,-5
        9,2
SQ 3060 DATA-1,"CENTAURUS","TH
        E CENTAUR",14.6,-61,1,
        14,-60,1
PP 3070 DATA-1,"ERIDANUS","THE
         RIVER",1.6,-58,1
HC 3080 DATA-1,"END"
PP 3090 PRINT"{@}{LEFT}";:YR$=
        RIGHT$(YR$,LEN(YR$)-1)
KF 3100 GETJF$:IFJF$=""THEN310
        0
DP 3110 JF%=ASC(JF$)
QF 3115 IFJF%>47ANDJF%<58THENY
        R$=YR$+JF$:PRINTJF$;:P
        RINT"{@}{LEFT}";:GOTO3
        100
HF 3120 IFJF%=20ANDLEN(YR$)>0T
        HENYR$=LEFT$(YR$,LEN(Y
        R$)-1):PRINT" {2 LEFT}
        {@}{LEFT}";:GOTO3100
QM 3130 IFJF%=13THENPRINT" ";:
        RETURN
FC 3140 GOTO3100
JG 3150 IF((YY/4=INT(YY/4))AND
        (YY/100<>INT(YY/100)))
        OR(YY/400=INT(YY/400))
        THEN3170
RM 3160 L1=0:GOTO3180
FC 3170 L1=1
XK 3180 RETURN
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Sprite Fader

See instructions in article on page 48 before typing in.

Program 1: Sprite Fader 64

```
CC00:4C 09 CC 4C 1B CD 4C 7D 86
CC08:CF 20 73 00 20 C6 CE 8C 46
CC10:B4 02 20 C3 CE 8C B3 02 D6
CC18:20 C3 CE 8C B2 02 A9 75 BB
CC20:8D 18 03 A9 CF 8D 19 03 6B
CC28:78 A9 EC 8D 14 03 A9 CE AD
CC30:8D 15 03 58 A0 00 A2 80 86
CC38:8A 99 F8 CB E8 C8 C0 08 4D
CC40:90 F6 A9 D0 85 FC A9 C0 56
CC48:85 FE A9 00 85 FB 85 FD BE
CC50:A2 08 A0 00 78 A5 01 29 D6
CC58:FB 85 01 B1 FB 91 FD C8 77
CC60:D0 F9 E6 FC E6 FE CA D0 27
CC68:F2 A5 01 09 07 85 01 58 3E
CC70:A9 C8 8D 88 02 A9 00 8D 8F
CC78:00 DD 85 FB A8 A9 20 8D B3
CC80:18 D0 A9 E0 85 FC A9 00 11
CC88:91 FB C8 D0 F9 E6 FC A5 1B
CC90:FC C9 E2 90 F1 AD 86 02 D5
CC98:A0 07 99 27 D0 88 10 FA AD
CCA0:A9 FF 8D 15 D0 AD B2 02 B6
CCA8:C9 02 B0 17 A9 18 8D B5 AD
CCB0:02 AD B2 02 F0 02 A9 FF 10
CCB8:8D 17 D0 A9 00 8D 1D D0 D4
CCC0:4C D9 CC A2 FF C9 03 F0 D8
CCC8:03 A0 00 2C A0 FF 8E 1D 0E
CCD0:D0 8C 17 D0 A9 30 8D B5 C4
CCD8:02 A0 00 AD B4 02 99 01 58
CCE0:D0 C8 C0 10 90 F8 A0 00 D7
CCE8:84 02 A2 00 8E 10 D0 AD 9D
CCF0:B3 02 99 00 D0 C8 C8 E8 3C
CCF8:18 6D B5 02 8D B3 02 90 A0
CD00:02 E6 02 A5 02 F0 0F BD A0
CD08:95 CF 8D B6 02 AD 10 D0 37
CD10:0D B6 02 8D 10 D0 C0 10 4E
CD18:90 D5 60 A9 00 8D B7 02 BF
CD20:8D B9 02 A8 99 00 E2 99 E7
CD28:00 E3 C8 D0 F7 20 73 00 0A
CD30:20 8B B0 A5 47 85 FD A5 21
CD38:48 85 FE A0 00 B1 FD 85 8B
CD40:02 C8 B1 FD 85 FB C8 B1 84
CD48:FD 85 FC A5 02 D0 05 A2 3E
CD50:0E 6C 00 03 C9 19 B0 F7 4A
CD58:20 C3 CE 8C BC 02 AC B7 96
CD60:02 B1 FB 20 AE CE C8 8C B9
CD68:B7 02 48 A9 00 85 FD A9 BF
CD70:C0 85 FE 68 18 0A 90 02 40
CD78:E6 FE 18 0A 90 02 E6 FE 44
CD80:18 0A 90 02 E6 FE 85 FD 19
CD88:AC B9 02 B9 CD CF 8D A7 35
CD90:CD C8 B9 CD CF C8 8C B9 CD
CD98:02 8D A8 CD A0 00 8C B8 61
CDA0:02 B1 FD AE B8 02 9D 00 5D
CDA8:E2 E8 E8 E8 8E B8 02 C8 BF
CDB0:C0 08 90 ED AC B7 02 C4 AC
CDB8:02 D0 A3 A9 00 8D A9 02 24
CDC0:8D AE 02 8D AC 02 8D AD 1E
CDC8:02 AD AC 02 18 69 01 8D 7C
CDD0:AC 02 90 03 EE AD 02 AD 65
CDD8:AD 02 C9 07 90 03 4C AD 4C
CDE0:CE AC AE 02 C0 10 90 18 84
CDE8:A0 00 8C AE 02 AE A9 02 71
CDF0:E8 8E A9 02 E0 18 B0 03 C5
CDF8:4C 7B CE A9 00 8D A9 02 99
CE00:B9 9D CF 85 FB C8 B9 9D 48
CE08:CF 85 FC C8 8C AE 02 A5 E3
CE10:FB 85 FD A5 FC 18 69 02 44
CE18:85 FE AC A9 02 B9 AD CF 8A
CE20:A8 78 A5 01 29 FD 85 01 42
CE28:B1 FB 8D A8 02 8C AA 02 73
CE30:B1 FD 48 A5 01 09 02 85 3F
CE38:01 58 68 8D AF 02 20 87 9F
CE40:CE A8 8C AB 02 B9 95 CF AD
CE48:8D A7 02 AD A8 02 2D A7 01
CE50:02 8D B0 02 AD AF 02 2D E5
CE58:A7 02 CD B0 02 F0 30 2D 70
CE60:AF 02 F0 03 4C 7E CE A9 48
CE68:FF 38 ED A7 02 8D A7 02 E3
CE70:AD A8 02 2D A7 02 AC AA 6B
CE78:02 91 FB 4C C9 CD AD A8 49
CE80:02 0D A7 02 4C 76 CE AD FE
CE88:04 DC C9 08 B0 F9 60 AD F4
CE90:A8 02 CD AF 02 D0 03 4C 5D
CE98:C9 CD AC AB 02 C8 C0 08 9B
CEA0:90 02 A0 00 8C AB 02 B9 EB
CEA8:95 CF 4C 48 CE 60 48 29 C4
CEB0:80 8D B6 02 68 29 3F 48 97
CEB8:AD B6 02 F0 04 68 09 40 3E
CEC0:60 68 60 20 FD AE 20 8A 2C
CEC8:AD 20 F7 B7 60 C8 C9 04 7D
CED0:D0 03 A9 E8 2C A9 CA 8D 86
CED8:DE CE B9 00 D0 AA CA 8A 22
CEE0:99 00 D0 C8 C8 C0 10 90 EB
CEE8:F1 4C 31 EA AD BC 02 D0 9C
CEF0:03 4C 31 EA 8D BD 02 A2 02
CEF8:00 A0 00 78 AD 11 D0 10 A9
CF00:FB AD BD 02 C9 01 F0 0E 23
CF08:C9 03 B0 C1 B9 00 D0 18 07
CF10:69 01 90 4B B0 08 B9 00 84
CF18:D0 38 E9 01 B0 41 BD 95 17
CF20:CF 8D BB 02 2D 10 D0 F0 DE
CF28:21 A9 FF 38 ED BB 02 8D 36
CF30:BB 02 AD 10 D0 2D BB 02 99
CF38:8D 10 D0 AD BD 02 C9 02 23
CF40:F0 03 A9 FF 2C A9 00 4C A2
CF48:5F CF AD 10 D0 0D BB 02 76
CF50:8D 10 D0 AD BD 02 C9 02 3B
CF58:F0 03 A9 FF 2C A9 00 99 08
CF60:00 D0 E8 C8 C8 C0 10 B0 F7
CF68:09 AD BD 02 C9 01 F0 A6 AA
CF70:D0 9A 4C 31 EA A9 04 8D 4F
CF78:88 02 4C 47 FE A9 00 8D 07
CF80:15 D0 A9 04 8D 88 02 A9 90
CF88:15 8D 18 D0 A9 97 8D 00 EC
CF90:DD 20 8A FF 60 01 02 04 87
CF98:08 10 20 40 80 00 E0 40 4E
CFA0:E0 80 E0 C0 E0 00 E1 40 04
CFA8:E1 80 E1 C0 E1 09 02 17 EF
```

```
CFB0:07 15 0B 00 13 03 10 11 50
CFB8:01 05 12 0F 0E 04 14 06 FB
CFC0:0D 0C 08 0A 16 FF FE FC 37
CFC8:F8 F0 E0 C0 80 00 E2 01 14
CFD0:E2 02 E2 40 E2 41 E2 42 E6
CFD8:E2 80 E2 81 E2 82 E2 C0 26
CFE0:E2 C1 E2 C2 E2 00 E3 01 CA
CFE8:E3 02 E3 40 E3 41 E3 42 A9
CFF0:E3 80 E3 81 E3 82 E3 C0 E8
CFF8:E3 C1 E3 C2 E3 00 00 00 C2
```

Program 2: Sprite Fader Demo

```
FH 10 REM COPYRIGHT 1989 COMPU
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MQ 20 IFPEEK(52224)<>76THENLOA
      D"FADER 64.ML",8,1
KD 30 POKE53280,0:POKE53281,0:
      PRINT"{CYN}";:POKE700,0
RJ 40 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1989 COMPUTE! PUB
      ., INC."
HP 50 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":GOSUB44
      0:PRINT"{CLR}"
GE 60 SYS52224,130,60,3:PRINT"
      {CLR}";:GOSUB440
EE 70 FORI=1TO4:READA$:SYS5222
      7,A$,0:FORDY=1TO300:NEXT
      DY,I
MF 80 FORI=1TO100:X=INT(RND(1)
      *15)+1:Y=INT(RND(1)*7):P
      OKE53287+Y,X:NEXTI
HA 90 DATA "COMPUTE'S GAZETTE"
      ,"{3 SPACES}PRESENTS..."
      ,"THE FANTASTIC..."
AM 100 DATA "SPRITE FADER 64!"
JC 110 GOSUB450:GOSUB440:PRINT
      "{CYN}{CLR}{DOWN}FOUR D
      IFFERENT TEXT SIZES!
      {YEL}"
BE 120 FORI=0TO3:A$="SIZE #"+S
      TR$(I+1):SYS52224,80,26
      ,I:SYS52227,A$,0
SG 130 GOSUB440:GOSUB450:NEXT
DS 140 PRINT"{CYN}";:SYS52224,
      120,100,2
DE 150 PRINT"{CLR}{3}AND MOVEM
      ENT TOO!";:GOSUB430
AG 160 FORI=1TO5:READA$:SYS522
      27,A$,1
BB 170 GETA$:IFA$=""THEN170
SQ 180 NEXT:READA$:SYS52227,A$
      ,1:FORI=53287TOI+7:POKE
      I,INT(RND(1)*14)+1:NEXT
DM 190 DATA "PRESS ANY KEY..."
      ,"SEE THE TEXT CHANGE ?
      ","AND AGAIN..."
GF 200 DATA "THIS FUNCTION IS
      {SPACE}GREAT","TO MAKE
      {SPACE}VIDEO BANNERS!"
PC 210 DATA "EVEN WITH COLORS!
      "
BG 220 GETA$:IFA$=""THEN220
CH 230 PRINT"{CLR}{WHT}MOVE TE
      XT IN FOUR DIRECTIONS!"
XJ 240 A$="THIS TEXT MOVES UP"
      :SYS52224,100,30,3:SYS5
      2227,A$,3:GOSUB440:GOSU
      B440
SB 250 A$="THIS TEXT MOVES DOW
      N":SYS52224,100,25,3:SY
      S52227,A$,4:GOSUB440
RP 260 GOSUB440:A$="THIS TEXT
      {SPACE}MOVES LEFT":SYS5
      2224,100,30,3:SYS52227,
      A$,1
KA 270 GOSUB440:GOSUB440:A$="T
      HIS TEXT MOVES RIGHT":S
      YS52224,100,30,3
JX 280 SYS52227,A$,2:GOSUB440:
      GOSUB440
GG 290 A$=" ":SYS52227,A$,0
CX 300 PRINT"{CLR}{GRN}CUSTOM
      {SPACE}CHARACTERS MAY A
      LSO BE USED!{8}":SYS522
      24,130,255,3
XB 310 FORI=0TO15:READA:POKE49
      392+I,A:NEXT
DE 320 DATA 0,3,31,255,255,31,
      3,0
PR 330 DATA 63,255,252,248,248
      ,252,255,63
JQ 340 A$="↑<===<GAZETTE>":SYS
      52227,A$,1:POKE198,0
QA 350 PRINT"{BLU}";:GOSUB430
CG 360 GETA$:IFA$=""THEN360
MM 370 A$=" ":SYS52227,A$,1:PO
      KE700,0
SM 380 PRINT"{CLR}{BLU}":SYS52
      224,130,90,1
BS 390 A$="PRESS ANY KEY TO RE
      START"
DP 400 SYS52227,A$,0
AG 410 GETA$:IFA$<>""THENRUN
FA 420 GOSUB450:GOTO390
JC 430 PRINT"{HOME}";:FORI=1TO
      22:PRINT"{DOWN}";:NEXT:
      PRINTTAB(8)"PRESS ANY K
      EY TO FADE"
BA 440 FORDY=1TO1000:NEXT:RETU
      RN
MA 450 FORDY=1TO300:NEXT:A$="
      {SPACE}":SYS52227,A$,0:
      RETURN
```

Quiz Maker

Article on page 36.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
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BJ 15 POKE155,0
CA 20 GOSUB600:GOTO35
XE 25 IFPEEK(65530)<>5THENGOSU
      B600
GD 30 REM ------ EDIT MENU ---
      --------
HJ 35 PRINT"{CLR}{PUR}{DOWN}
      {3 SPACES}COPYRIGHT 1989
       COMPUTE! PUB., INC."
QX 40 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED{CYN}":PR
      INT"{3 DOWN}"
KD 45 PRINT"{5 SPACES}PRESS:
      {DOWN}":PRINT"{5 SPACES}
      {RVS}+{OFF} TO ADD DATA
      {DOWN}"
RX 50 PRINT"{5 SPACES}{RVS}-
      {OFF} TO ERASE ALL DATA
      {DOWN}"
FF 55 PRINT"{5 SPACES}{RVS}S
      {OFF} TO SAVE THIS VERSI
      ON{DOWN}"
XQ 60 PRINT"{5 SPACES}{RVS}ANY
       OTHER KEY{OFF} TO PLAY
      {5 DOWN}"
SM 65 PRINT"{13 SPACES}{RVS}
      {PUR} ENTER CHOICE {OFF}
      "
GS 70 GETK$:IFK$=""GOTO70
FR 75 IFK$="-"THEN105
BJ 80 IFK$="+"THENGOSUB545:GOT
      O155
GK 85 IFK$<>"S"THEN215
BB 90 PRINTCL$"ENTER NEW FILEN
      AME: ";:LL=16:GOSUB500:I
      FD$=""THEN35
XQ 95 OPEN15,8,15,"S0:"+D$:CLO
      SE15:SAVED$,8,1:GOTO35
JJ 100 REM --------- ERASE DAT
       A ----------
KH 105 POKE155,0:PRINT"{CLR}":
       RESTORE:READDT:IFDT=0TH
       EN35
MK 110 RESTORE:READDT
DB 115 IFDT=0THEN25
BD 120 LN=(DT-1)*10+1010:PRINT
       "{CLR}"LN:PRINTLN+5
BX 125 PRINT"1000 DATA"MID$(ST
       R$(DT-1),2)
AS 130 IFPEEK(65530)=67THENPRI
       NT"KB=631:NK=198:";
BJ 135 IFPEEK(65530)=164THENPR
       INT"KB=1319:NK=239:";
KX 140 PRINT"PRINTSS$:GOTO110"
CX 145 POKEKB,19:FORI=KB+1TOKB
       +4:POKEI,13:NEXT:POKENK
       ,5:END
BR 150 REM --------- ENTER DAT
       A ----------
FC 155 RESTORE:READGD:DT=GD+1:
       BD=PEEK(155):GD=GD-BD:G
       OSUB565
KX 160 PRINT"{RVS}{DOWN}ENTER
       {SPACE}WORD (18 CHARACT
       ERS MAXIMUM):"
PQ 165 LL=18:GOSUB500:W$(DT)=C
       HR$(34)+D$
BG 170 PRINT:PRINT"{2 DOWN}
       {RVS}ENTER SENTENCE (69
        CHARACTERS MAXIMUM):"
SP 175 LL=69:GOSUB500:D$(DT)=C
       HR$(34)+D$
JA 180 LN=(DT-1)*10+1010:PRINT
       "{CLR}1000 DATA"MID$(ST
       R$(DT),2)
XP 185 PRINTMID$(STR$(LN),2)"D
       ATA"W$(DT):PRINTMID$(ST
       R$(LN+5),2)"DATA"D$(DT)
JK 190 IFPEEK(65530)=67THENPRI
       NT"KB=631:NK=198:";
KR 195 IFPEEK(65530)=164THENPR
       INT"KB=1319:NK=239:";
XC 200 PRINT"PRINTSS$:GOTO25"
SX 205 POKEKB,19:FORI=KB+1TOKB
       +4:POKEI,13:NEXT:POKENK
       ,5:POKE155,PEEK(155)+1:
       END
SG 210 REM -------- MAIN GAME
       {SPACE}-------------
CF 215 RESTORE:READN:IFN=0THEN
       PRINT"{CLR}NO DATA EXIS
       TS.":FORI=1TO1750:NEXT:
       GOTO35
XF 220 PRINTCL$"{CYN}HOLD ON W
       HILE I SHUFFLE THE FLAS
       H CARDS."
HK 225 GD=0:BD=0:N=N-1:FORL=0T
       ON:READW$(L),D$(L):NEXT
       :GOSUB400
SD 230 H=1:GOSUB545:IFLPTHEN24
       5
JP 235 FORLP=0TON:IFFTHENH=1:G
       OSUB545:GOTO245
SX 240 IFLP>0THENGOSUB565:GOTO
       275
CB 245 F=0:R=1:MX=15:IFMX>(N-G
       )THENMX=N-G
RK 250 FORY=0TOMX:GOSUB320:NEX
       T:Y=0:POKEP,21:PRINT
PK 255 PRINT"{PUR}{3 SPACES}US
       E CURSOR KEYS TO MOVE C
       URSOR"
XE 260 I=23:IFN<=MXTHEN270
BD 265 I=24:POKEP,22:PRINT:PRI
       NT"{2 SPACES}PRESS THE
       {SPACE}[M] KEY FOR MORE
        CHOICES
PX 270 POKEP,I-1:PRINT:PRINT"
       {4 SPACES}PRESS {RVS}RE
       TURN{OFF} TO SELECT A M
       ATCH{CYN}{HOME}":POKENK
       ,0
GE 275 R=ABS(R<1):GOSUB320:T=0
KC 280 GETA$:T=T+1:IFA$=""ANDT
       <20THEN280
```

```
DQ 285 IFA$="{DOWN}"THENR=1:GO
       SUB320:Y=Y+1:GOSUB330:G
       OTO275
XA 290 IFA$="{RIGHT}"ANDY+8<=M
       XTHENR=1:GOSUB320:Y=Y+8
       :GOSUB330:GOTO275
MJ 295 IFA$="{UP}"THENR=1:GOSU
       B320:Y=Y-1:GOSUB330:GOT
       O275
EA 300 IFA$="{LEFT}"ANDY-8=>0T
       HENR=1:GOSUB320:Y=Y-8:G
       OSUB330:GOTO275
FK 305 IFA$="M"THENG=(G+16)*-(
       G<=N-16):GOTO230
QH 310 IFA$=CHR$(13)THENGOSUB4
       30:NEXT:GOTO350:REM ---
       -- FINAL SCORE -----
GQ 315 GOTO275
HM 320 RL=Y-(8*-(Y=>8)):POKEP,
       RL+11
GM 325 PRINT:PRINTTAB(X(-(Y=>8
       )));R$(R)W$(RA(Y+G))
HG 330 IFY>MXTHENY=0
QM 335 IFY<0THENY=MX
HP 340 RETURN
MK 345 REM ---- PRINT FINAL SC
       ORES --------
MD 350 PRINTCL$"{PUR}{RVS}"S$"
       {4 SPACES}":PRINT"{RVS}
        FINAL SCORE {OFF}";
QQ 355 PRINT" {CYN}"MID$(STR$(
       INT(100*((100*GD)/(100*
       (N+1))))),2)"%
       {2 SPACES}";
MX 360 PRINTGD"RIGHT "BD"WRONG
       "
RS 365 PRINT"{RVS}{PUR}"S$"
       {4 SPACES}"
KM 370 PRINT"{3 DOWN}
       {7 SPACES}PRESS {RVS}RE
       TURN{OFF} TO PLAY AGAIN
       "
JQ 375 GETK$:IFK$=""THEN375
KC 380 IFK$=CHR$(13)THENRUN
RQ 385 PRINT"{UP}{8 SPACES}THA
       NK YOU FOR TAKING THE "
RH 390 PRINTTAB(15)"{3 SPACES}
       QUIZ":PRINT"{4 DOWN}":E
       ND
FQ 395 REM -- SCRAMBLED NUMBER
        SUBROUTINE --
SJ 400 FORI=0TON:RA(I)=I:NEXT:
       FORI=0TON
EM 405 A=INT(RND(1)*N+1):B=RA(
       A):RA(A)=RA(I):RA(I)=B:
       NEXT
JQ 410 FORDL=1TO69:DL$=DL$+" "
       :NEXT
BS 415 FORI=0TON:RB(I)=I:NEXT:
       FORI=0TON
FH 420 A=INT(RND(1)*N+1):B=RB(
       A):RB(A)=RB(I):RB(I)=B:
       NEXT:RETURN
QJ 425 REM -------- GET SCORE
       {SPACE}-------------
RM 430 IFRA(Y+G)=RB(LP)THENGD=
       GD+1:GOTO455
SK 435 BD=BD+1:GOSUB465:PRINTC
       L$"{3 UP}{CYN}
       {9 SPACES}THE CORRECT A
       NSWER IS...{3 DOWN}
       {PUR}"
EB 440 PRINTD$(RB(LP))"
       {2 DOWN}":PRINTTAB(INT(
       20-(LEN(W$(RB(LP)))/2))
       )"{RVS}{CYN}"W$(RB(LP))
AS 445 PRINTTAB(8)"{5 DOWN}
       {PUR}PRESS ANY KEY TO C
       ONTINUE":F=1
JE 450 GETK$:IFK$=""GOTO450
AE 455 POKEP,8:PRINT:PRINTDL$;
       :RETURN
EE 460 REM ---- ERROR BEEP(LOW
       ) -----------
PS 465 IFPEEK(65530)=164THENVO
       L7:SOUND 1,100,18:RETUR
       N
JC 470 V=15:POKES+24,V:POKES+5
       ,21:POKES+6,245
DD 475 POKES+4,33:POKES+1,8:FO
       RT=60TO100:IFT>95THENV=
       V-2:POKES+24,V
PA 480 NEXT
XR 485 FORE=STOS+24:POKEE,0:NE
       XT
RA 490 T=0:RETURN
MS 495 REM ------ INPUT ROUTIN
       E -------
AX 500 C=0:D$=""
DK 505 GETA$:IFA$=""THEN505
DF 510 A=ASC(A$):IFA=13THENRET
       URN
MJ 515 IFA=19THENFORI=0TOC-1:P
       RINTCHR$(20);:NEXT:GOTO
       500
KB 520 IFA<>20ORC<1THEN530
AH 525 PRINTCHR$(20);:C=C-1:D$
       =LEFT$(D$,C):GOTO505
RA 530 IFA<32ORA>90THEN505
AK 535 IFC=LLTHEN505
JS 540 PRINTA$;:D$=D$+A$:C=C+1
       :GOTO505
KA 545 PRINT"{CLR} {RVS}{PUR}U
       "B$B$B$B$"I{OFF}"
DS 550 PRINT" {RVS}B";S$$$$$$S
       ;"B{OFF}":PRINT" {RVS}B
       "T1$(H)"B{OFF}"
KD 555 PRINT" {RVS}B";S$$$$$$S
       ;"B{OFF}":PRINT" {RVS}J
       "B$B$B$B$"K{OFF}"
MJ 560 PRINT" {*}{RVS}"S$$$$$S
       $"{OFF}£":PRINT"
       {2 SPACES}{*}{RVS}"S$"
       {3 SPACES}"SB$(H)"
       {3 SPACES}"S$"{OFF}£
       {CYN}"
HQ 565 GD$=MID$(STR$(GD),2):IF
       GD>9THENGD$="{LEFT}"+GD
       $
KE 570 BD$=MID$(STR$(BD),2):IF
       BD>9THENBD$="{LEFT}"+BD
       $
FE 575 POKEP,6:PRINT:PRINT"
       {3 SPACES}B "GD$F1$(H)T
       AB(14)"{*}{RVS}"S$"
       {OFF}£{2 SPACES}"BD$F2
       $(H);
EE 580 PRINTTAB(36)"B":PRINT"
       {3 SPACES}J"B$B$B$"CCCC
       CK"
XE 585 PRINT"{PUR}"D$(RB(LP))"
       {CYN}";:IFLEN(D$(RB(LP)
       ))<40THENPRINTLEFT$(DL$
       ,40);
AP 590 RETURN
JD 595 REM --- 64, 128, OR +4?
        ---
BK 600 P=235:KB=842:NK=208:IFP
       EEK(65530)=67THENP=214:
       NK=198:KB=631
JC 605 SC=53281:BO=53280:IFPEE
       K(65530)<>164THEN615
CP 610 SC=65301:BO=65305:P=205
       :NK=239:KB=1319
HG 615 X=RND(-TI):T1$(1)="
       {13 SPACES}QUIZ MAKER
       {13 SPACES}"
KD 620 T1$(0)="{9 SPACES}QUIZ
       {SPACE}MAKER EDITOR
       {10 SPACES}"
QE 625 F1$(0)=" OLD":F1$(1)="
       {SPACE}RIGHT":F2$(0)="
       {SPACE}NEW{2 SPACES}"
RS 630 RESTORE:READN:DIMW$(N+5
       0),D$(N+50),RA(N+50),RB
       (N+50)
CG 635 SS$="{HOME}":UL$="EEEEE
       EEE":CL$="{CLR}{8 DOWN}
       "
XJ 640 F2$(1)=" WRONG ":SB$(0)
       ="DATA COUNT":SB$(1)="S
       COREBOARD"
RC 645 R$(0)="{RVS}":R$(1)="
       {OFF}":S=54272:X(0)=2:X
       (1)=21:B$="CCCCCCCCC":S
       $="{9 SPACES}"
HR 650 POKEBO,4:POKESC,0:RETUR
       N
XX 999 REM ----------- DATA --
       ----------
GQ 1000 DATA17
XF 1010 DATA"EXONERATE
GK 1015 DATA"TO FREE OF GUILT
       {SPACE}OR BLAME, DECLA
       RE INNO-CENT
GC 1020 DATA"ADAMANT
KS 1025 DATA"UNSHAKABLE OR IMM
       OVABLE ESPECIALLY IN
       {3 SPACES}OPPOSITION;
       {SPACE}UNYIELDING
PJ 1030 DATA"CALLOUS
MA 1035 DATA"BEING HARDENED AN
       D THICKENED; FEELING N
       OEMOTION
SB 1040 DATA"FURTIVE
HE 1045 DATA"DONE BY STEALTH O
       E EXPRESSIVE OF STEALT
       H; OBTAINED UNDERHANDE
       DLY
HJ 1050 DATA"EQUITABLE
QX 1055 DATA"DEALING FAIRLY AN
       D EQUALLY WITH ALL CON
       -CERNED
XM 1060 DATA"HARBINGER
QR 1065 DATA"ONE THAT PRESAGES
        OR FORESHADOWS WHAT I
       STO COME
RP 1070 DATA"FOIBLE
BS 1075 DATA"A MINOR FLAW OR S
       HORTCOMING IN CHARACTE
       ROR BEHAVIOR; WEAKNESS
EQ 1080 DATA"INCESSANT
MM 1085 DATA"CONTINUING OR FOL
       LOWING WITHOUT INTER-
       {2 SPACES}RUPTION; UNC
       EASING
JF 1090 DATA"INTREPID
MM 1095 DATA"CHARACTERIZED BY
       {SPACE}RESOLUTE FEARLE
       SSNESS, FORTITUDE, AND
        ENDURANCE
QB 1100 DATA"LACONIC
GG 1105 DATA"USING OR INVOLVIN
       G THE USE OF A MINIMUM
        OF WORDS; CONCISE
KP 1110 DATA"LOQUACIOUS
GS 1115 DATA"GIVEN TO EXCESSIV
       E TALKING: GARRULOUS;
       {2 SPACES}FULL OF EXCE
       SSIVE TALK: WORDY
GQ 1120 DATA"LUCID
RJ 1125 DATA"SUFFUSED WITH LIG
       HT: LUMINOUS; CLEAR IN
        UNDERSTANDING: INTELL
       IGIBLE
EG 1130 DATA"MISSIVE
MQ 1135 DATA"A WRITTEN COMMUNI
       CATION: LETTER
EB 1140 DATA"MOLLIFY
MS 1145 DATA"TO SOOTHE IN TEMP
       ER OR DISPOSITION: APP
       EASE: TO SOFTEN; TO AS
       SUAGE
CM 1150 DATA"NEFARIOUS
KS 1155 DATA"FLAGRANTLY WICKED
        OR IMPIOUS: EVIL
GH 1160 DATA"OPULENCE
EJ 1165 DATA"WEALTH, AFFLUENCE
```

```
        ; ABUNDANT OR PLENTIFU
        L
RQ 1170 DATA"RETICENT
AM 1175 DATA"INCLINED TO BE SI
        LENT OR INCOMMUNICATIV
        EIN SPEECH:RESERVED; R
        ELUCTANT
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Marathon

Program 1: Marathon BASIC

Article on page 30.

```
EM 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
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CF 20 FAST:DIMZX(18),ZY(18),NS
      (18),SP(18),CO(15):GRAPH
      IC1,1:IFPEEK(4865)<>214T
      HENBLOAD"MARATHON{SPACE}
      ML",B0,P4864
MM 30 COLOR0,1:COLOR4,1:GOSUB4
      20
EB 40 IFSC>HSTHENHS=SC
QF 50 LV=0:L=0:SD=0:SC=0:M2=0:
      M3=.01:MS=26:YL=0:YM=0:P
      OKEDEC("0B80"),1
AB 60 PS=300:FORT=0TO1:POKEDEC
      ("0BA0")+T,0:NEXT:POKEDE
      C("D015"),1:SYSDEC("14C7
      ")
HA 70 FORT=0TO6STEP2:POKEDEC("
      0B51")+T,T/2:NEXT
HH 80 GRAPHIC1,1:POKEDEC("0B80
      "),1
SF 90 CA$="{2 I}{SPACE}{2 I}
      {SPACE}{2 I}{SPACE}{2 I}
      {SPACE}{2 I}{SPACE}{2 I}
      {SPACE}{2 I}{SPACE}{2 I}
      {SPACE}{2 I}{SPACE}{2 I}
      {SPACE}{2 I}"
FD 100 CB$="{2 U}{SPACE}{2 U}
       {SPACE}{2 U}{SPACE}
       {2 U}{SPACE}{2 U}
       {SPACE}{2 U}{SPACE}
       {2 U}{SPACE}{2 U}
       {SPACE}{2 U}{SPACE}{2 U}":BOX1,4,0,
       232,188:GOTO130
AC 110 FORT=0TO10:GOSUB120:CHA
       R1,2,T*2+1,CA$:CHAR1,2,
       T*2+2,CB$:NEXT:BOX1,4,0
       ,232,188:RETURN
FB 120 CO=CO+1+(CO=12)*12:COLO
       R1,CO(CO):RETURN
FE 130 LV=LV+1:L=L+1+(L=17):PO
       KEDEC("14E4"),SP(L):IFL
       V/4=INT(LV/4)THENYL=YL-
       1
SB 140 SPRITE1,1,11:MOVSPR1,15
       2,128:SPRITE8,0,11:SLEE
       P2
DS 150 GOSUB620:FORT=0TO1:POKE
       DEC("0B04")+T,0:POKEDEC
       ("0BA0")+T,0:NEXT
JR 160 GOSUB110:FORT=0TO5:POKE
       DEC("0B82")+T,0:NEXT:PO
       KEDEC("0B51"),4
XB 170 B=0:ML=2-YL:GOSUB490:SL
       OW:SLEEP1:AF=1:SD=SC:PO
       KEDEC("0B80"),0
RE 180 YM=YM+1:IFYM=750THENPOK
       EDEC("0B80"),1:YM=0:GOT
       O400
SH 190 SYSDEC("14F5"):IFPEEK(D
       EC("0BB5"))THENGOSUB280
       :SYSDEC("1511")
QR 200 IFPEEK(DEC("0BA0"))<>PS
       THENGOSUB340:AF=1
EX 210 IFAF=1THENAF=0:P7=-(P7=
       0):GOSUB300
EF 220 IFPEEK(DEC("0B04"))THEN
       360
PF 230 IFPEEK(DEC("0B05"))ANDB
       =0THENSOUND3,500,20:B=1
       :TI$="000000"
CE 240 IFB=1ANDTI$>"000004"THE
       NB=2:GOSUB620
MX 250 P8=-(P8=0):POKEDEC("1FF
       F"),62+P8
MK 260 IFMS=0THEN330
JG 270 GOTO180
AA 280 SOUND1,600,1:DT=DT+1:IF
       DT>5THENDT=0:GOSUB310
SK 290 RETURN
RM 300 MOVSPR8,ZX(INT(RND(1)*6
       )+2),ZY(INT(RND(1)*7)+2
       ):SPRITE8,1,3+P7
HE 310 M2=M2+.01:SOUND2,50000,
       1:MS=26-INT(M2*100)/100
JA 320 COLOR1,11:CHAR1,39-LEN(
       STR$(MS)),23,STR$(MS):R
       ETURN
DX 330 POKEDEC("0B80"),1:COLOR
       1,2:CHAR1,2,12,"YOU'RE
       {SPACE}THE{SPACE}GREATE
       ST{SPACE}RUNNER{SPACE}I
       N{SPACE}HISTORY",1:END
ME 340 SC=SD+LV*15*(PEEK(DEC("
       0BA0"))+256*PEEK(DEC("0
       BA1")));PS=PEEK(DEC("0B
       A0"))
SE 350 SOUND2,1000,5:COLOR1,15
       :CHAR1,39-LEN(STR$(SC))
       ,13,STR$(SC):AF=0:RETUR
       N
JB 360 SOUND1,10000,40,1,300,1
       00,0:YL=YL+1:IFYL<3THEN
       140
XR 370 COLOR1,2:CHAR1,2,12,"TH
       E{SPACE}MARATHON{SPACE}
       HAS{SPACE}TERMINATED",1
       :COLOR1,16:PLAYM2$
XC 380 CHAR1,3,14,"PRESS
       {SPACE}FIRE{SPACE}TO
       {SPACE}PLAY{SPACE}AGAIN
       ",1
AG 390 V=JOY(2)AND128:IFV=128T
       HENFAST:GOTO40:ELSE390
KJ 400 COLOR1,2:PLAYM1$ :POKED
       EC("D015"),1
SD 410 CHAR1,4,12,"{SPACE}PREP
       ARE{SPACE}FOR{SPACE}LEV
       EL{SPACE}"+STR$(LV+1)+"
       {SPACE}",1:SLEEP3:GOTO1
       30
JJ 420 FORT=0TO1:READX(T),Y(T)
       :NEXT:FORT=1TO12:READCO
       (T):NEXT
JC 430 FORT=1TO17:READNS(T),SP
       (T):NEXT
RS 440 M1$="V203T7U7WAIBIAIBIA
       IBIAIBIAIBIAIBQDICSBQFI
       ESDICIBWAQG"
AR 450 M2$="V202T7U8QBQAHBHCQG
       QFHEQDQCIBIAQBICIDICWAQ
       G"
HG 460 FORT=0TO9:Z=32+T*24:POK
       E2848+T,Z:ZX(T)=Z:NEXT
SF 470 FORT=0TO11:Z=48+T*16:PO
       KE2864+T,Z:ZY(T)=Z:NEXT
RF 480 FORT=0TO511:POKEDEC("0E
       00")+T,PEEK(DEC("1523")
       +T):NEXT:RETURN
SK 490 COLOR1,6:CHAR1,34,4,"HI
       GH",1:CHAR1,33,5,"SCORE
       ",1:HS$=STR$(HS)
CA 500 CHAR1,39-LEN(HS$),7,HS$
       :LV$=STR$(LV):BOX1,240,
       54,319,66
BG 510 DRAW1,240,54TO21;45TO55
       ;90TO20;150:PAINT1,249,
       52
RX 520 COLOR1,8:CHAR1,33,0,"LE
       VEL",1:CHAR1,39-LEN(LV$
       ),2,LV$:BOX1,240,14,319
       ,26
ED 530 DRAW1,240,14TO21;45TO55
       ;90TO20;150:PAINT1,249,
       10
QR 540 COLOR1,13:CHAR1,7,24,"
       {SPACE}M{SPACE}A{SPACE}
       R{SPACE}A{SPACE}T
       {SPACE}H{SPACE}O{SPACE}
       N{SPACE}",1
GB 550 COLOR1,15:CHAR1,34,10,"
       YOUR",1:CHAR1,33,11,"SC
       ORE",1:BOX1,240,102,319
       ,114
PC 560 DRAW1,240,102TO21;45TO5
       5;90TO20;150:PAINT1,249
       ,100
HP 570 COLOR1,5:CHAR1,32,16,"R
       UNNERS",1:CHAR1,37,18,S
       TR$(ML):BOX1,240,142,31
       9,154
GR 580 DRAW1,240,142TO21;45TO5
       5;90TO20;150:PAINT1,249
       ,140
SE 590 COLOR1,11:CHAR1,32,20,"
       {SPACE}MILES{SPACE}",1:
       CHAR1,32,21,"{SPACE}TO
       {SPACE}GO{SPACE}",1
RD 600 BOX1,240,182,319,192:DR
       AW1,240,182TO21;45TO55;
       90TO20;150:PAINT1,249,1
       80
PQ 610 RETURN
EM 620 FORT=2TO1+NS(L):MOVSPRT
       ,X(INT(RND(1)*2)),Y(INT
       (RND(1)*2)):SPRITET,1,2
       :NEXT:RETURN
XS 630 DATA 32,48,248,224,8,14
       ,6,4,15,7,5,3,11,9,10,1
       2
GX 640 DATA 2,3,2,2,2,2,3,3,3,
       2,3,2,4,3,4,2,4,2,5,4,5
       ,3,5,3,5,3,6,4,6,4,6,3,
       6,3
```

Program 2: Marathon ML

See instructions in article on page 30 before typing in.

```
1300:BD D6 11 8D 00 0B BD D7 35
1308:11 8D 01 0B A9 00 85 FC 40
1310:EA A0 0A B9 1F 0B CD 00 71
1318:0B F0 04 88 D0 F5 60 A0 C8
1320:0C B9 2F 0B CD 01 0B F0 CA
1328:04 88 D0 F5 60 A9 01 85 1D
1330:FC EA 60 BD D6 11 C9 20 26
1338:F0 08 A9 3A 9D 40 0B DE 94
1340:D6 11 60 BD D7 11 C9 30 C4
1348:F0 08 A9 3C 9D 40 0B DE C4
1350:D7 11 60 BD D6 11 C9 F8 16
1358:F0 08 A9 38 9D 40 0B FE B4
1360:D6 11 60 BD D7 11 C9 E0 95
1368:F0 F8 A9 3C 9D 40 0B FE 41
1370:D7 11 60 E6 FA A5 FA 29 CE
1378:03 C9 01 30 17 BD D6 11 24
1380:38 ED D6 11 F0 0E 30 06 50
1388:A9 00 9D 41 0B 60 A9 02 7A
1390:9D 41 0B 60 BD D7 11 38 E4
1398:ED D7 11 F0 F6 30 06 A9 0B
13A0:01 9D 41 0B 60 A9 03 9D D4
13A8:41 0B 60 BD 41 0B D0 04 F5
13B0:20 33 13 60 C9 01 D0 04 14
```

```
13B8:20 43 13 60 C9 02 D0 04 24
13C0:20 53 13 60 20 63 13 60 49
13C8:BD 51 0B F0 04 DE 51 0B DB
13D0:60 A9 04 9D 51 0B FE 50 F0
13D8:0B BD 50 0B 29 01 18 7D A9
13E0:40 0B 85 FB 8A 4A A8 A5 CE
13E8:FB 99 F8 1F 60 A2 0C 20 4A
13F0:00 13 A5 FC F0 03 20 73 A7
13F8:13 20 AB 13 20 C8 13 CA 6C
1400:CA D0 EC 60 AD 00 DC 8D 1A
1408:08 0B 29 10 D0 03 20 B5 A5
1410:14 AD 08 0B 29 0F C9 0E 86
1418:D0 08 A9 00 8D 07 0B 4C CA
1420:43 14 C9 07 D0 08 A9 01 93
1428:8D 07 0B 4C 43 14 C9 0D 0A
1430:D0 08 A9 02 8D 07 0B 4C 03
1438:43 14 C9 0B D0 05 A9 03 E1
1440:8D 07 0B A2 00 AD D6 11 F1
1448:8D 00 0B AD D7 11 8D 01 92
1450:0B 20 00 13 A5 FC F0 06 40
1458:AD 07 0B 8D 09 0B AD 09 2C
1460:0B D0 06 20 43 13 4C 80 84
1468:14 C9 01 D0 06 20 53 13 A4
1470:4C 80 14 C9 02 D0 06 20 7D
1478:63 13 4C 80 14 20 33 13 43
1480:20 C8 13 60 AD 1E D0 8D 68
1488:06 0B AD 06 0B 29 81 C9 56
1490:81 D0 11 AD 15 D0 29 7F 68
1498:8D 15 D0 EE A0 0B D0 03 AB
14A0:EE A1 0B 60 AD 06 0B 29 D4
14A8:01 D0 01 60 A9 01 8D 04 1C
14B0:0B 8D 80 0B 60 AD 05 0B 51
14B8:F0 01 60 AD 15 D0 29 81 40
14C0:8D 15 D0 8D 05 0B 60 78 75
14C8:A9 D4 8D 14 03 A9 14 8D 62
14D0:15 03 58 60 AD 80 0B F0 CB
14D8:03 4C 65 FA 20 04 14 A5 D0
14E0:FE D0 0A A9 03 85 FE 20 E4
14E8:ED 13 20 ED 13 C6 FE 20 81
14F0:84 14 4C 65 FA A9 00 8D 4C
14F8:B5 0B AD D6 11 CD B6 0B 1A
1500:D0 09 AD D7 11 CD B7 0B 42
1508:D0 01 60 A9 01 8D B5 0B 36
1510:60 AD D6 11 8D B6 0B AD CC
1518:D7 11 8D B7 0B A9 00 8D 2C
1520:B5 0B 60 00 00 00 00 00 F3
1528:00 00 00 00 00 00 00 00 52
1530:00 00 00 00 00 06 00 00 72
1538:06 00 00 0C 00 00 3D 00 A0
1540:00 7A 00 00 38 00 00 E8 B3
1548:00 00 08 00 00 00 00 00 73
1550:00 00 00 00 00 00 00 00 7A
1558:00 00 00 00 00 00 00 00 82
1560:00 00 00 00 00 00 00 00 8A
1568:00 00 00 00 00 00 00 00 92
1570:00 00 00 00 00 06 00 00 B2
1578:06 00 00 0C 00 00 1C 00 9E
1580:00 3B 00 00 38 00 00 26 61
1588:00 00 24 00 00 00 00 00 37
1590:00 00 00 00 00 00 00 00 BA
1598:00 00 00 00 00 00 00 00 C2
15A0:00 00 00 00 00 00 00 00 CA
15A8:00 00 00 00 00 00 00 00 D2
15B0:00 00 00 00 00 60 00 00 5C
15B8:60 00 00 10 00 00 78 00 05
15C0:00 1C 00 00 3C 00 00 44 18
15C8:00 00 83 00 00 00 00 00 63
15D0:00 00 00 00 00 00 00 00 FA
15D8:00 00 00 00 00 00 00 00 03
15E0:00 00 00 00 00 00 00 00 0B
15E8:00 00 00 00 00 00 00 00 13
15F0:00 00 00 00 00 30 00 00 DB
15F8:30 00 00 98 00 00 78 00 B5
1600:00 1C 00 00 1C 00 00 24 38
1608:00 00 68 00 00 24 00 00 D1
1610:00 00 00 00 00 00 00 00 3C
1618:00 00 00 00 00 00 00 00 44
1620:00 00 00 00 00 00 00 00 4C
1628:00 00 00 00 00 00 00 00 54
1630:00 00 00 00 00 1C 00 00 CC
1638:1C 00 00 48 00 00 3C 00 6F
1640:00 1E 00 00 1C 00 00 14 E8
1648:00 00 04 00 00 04 00 00 05
1650:00 00 00 00 00 00 00 00 7C
1658:00 00 00 00 00 00 00 00 84
1660:00 00 00 00 00 00 00 00 8C
1668:00 00 00 00 00 00 00 00 94
1670:00 00 00 00 00 00 1C 00 00 0D
1678:1C 00 00 09 00 00 1E 00 7F
1680:00 3C 00 00 1C 00 00 14 B0
1688:00 00 10 00 00 10 00 00 F6
1690:00 00 00 00 00 00 00 00 BC
1698:00 00 00 00 00 00 00 00 C4
16A0:00 00 00 00 00 00 00 00 CC
16A8:00 00 00 00 00 00 00 00 D4
16B0:00 00 00 00 00 00 00 00 DC
16B8:6C 00 00 54 00 00 6C 00 39
16C0:00 78 00 00 40 00 00 40 4D
16C8:00 00 40 00 00 00 00 00 FC
16D0:00 00 00 00 00 00 00 00 FC
16D8:00 00 00 00 00 00 00 00 05
16E0:00 00 04 00 00 00 00 00 8D
16E8:00 00 00 00 00 00 00 00 15
16F0:00 00 00 00 00 00 00 00 1D
16F8:54 00 00 68 00 00 7C 00 CE
1700:00 54 00 00 40 00 00 40 85
1708:00 00 40 00 00 00 00 00 3E
1710:00 00 00 00 00 00 00 00 3E
1718:00 00 00 00 00 00 00 00 46
1720:00 00 04 FF 57 0B 00 00 B5
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

VDC Graphics:

Bitmapped Graphics on the 80-Column Screen

Program 1: VDC Graphics

See instructions in article on page 38 before typing in.

```
1300:4C 07 1B 4C 9C 18 4C 2F 43
1308:19 4C 55 1A 4C AB 19 4C A9
1310:EF 18 4C 46 19 4C 51 19 D7
1318:4C 9D 19 4C A1 1A 4C B9 7B
1320:1A 4C D0 1A 4C FD 13 4C EE
1328:11 14 4C 22 14 4C 56 14 1A
1330:4C 48 15 4C 9D 16 4C EC C0
1338:17 4C C3 17 4C 12 15 4C 08
1340:22 15 4C 00 40 B4 BA B1 42
1348:80 40 20 10 08 04 02 01 19
1350:7F BF DF EF F7 FB FD FE CB
1358:00 50 A0 F0 40 90 E0 30 EB
1360:80 D0 20 70 C0 10 60 B0 BD
1368:00 00 00 00 01 01 01 02 9E
1370:02 02 03 03 03 04 04 04 DC
1378:00 05 0A 0F 14 19 1E 23 76
1380:28 2D 32 37 3C 13 13 13 27
1388:48 13 48 48 13 13 13 13 43
1390:02 05 08 45 0B 45 45 0E 54
1398:11 14 17 43 41 4C CC 00 38
13A0:1E F6 E8 1B 13 1E 13 21 BA
13A8:13 B7 48 19 AA 7B 0C DD 1A
13B0:0F 53 B5 F9 32 82 E4 37 26
13B8:9F 9B F8 F9 FB FA EC E6 E0
13C0:E4 E5 C3 C2 C1 C7 C0 C1 E7
13C8:C6 E2 60 AF 04 04 A2 FF 87
13D0:CB A1 D0 F6 AF 58 13 0F E2
13D8:02 04 4F 03 04 04 A9 4D EB
13E0:01 04 A8 AF 97 13 98 C8 9B
13E8:04 2C 5D 9B 13 5D 4B 13 39
13F0:F0 08 04 5D 9D 45 1B E8 09
13F8:D0 EC 4C 14 1B A9 00 8D 9A
1400:00 FF A2 19 20 DA CD 09 1F
1408:40 29 7F 20 CC CD 4C 62 25
1410:FF A9 00 8D 00 FF A2 19 D9
1418:20 DA CD 09 80 29 BF 4C C5
1420:CC CD A2 12 A9 00 8D 00 FF
1428:FF 20 CC CD E8 20 CC CD FD
1430:A9 18 20 DA CD 29 7F 20 17
1438:CC CD A9 00 A2 1F 20 CC 0E
1440:CD A0 3F A2 1E A9 FF 20 41
1448:CC CD 88 D0 FA 60 20 FD FF
1450:14 A9 00 8D 00 FF AD 6B 8C
1458:11 F0 11 E6 FB D0 02 E6 E3
1460:FC 20 6C 14 A5 FB D0 02 9E
1468:C6 FC C6 FB 20 AE 17 90 46
1470:2A 20 9C 14 20 CC 14 20 07
1478:DF 14 A5 FB 29 07 A8 A5 66
1480:FA A6 83 F0 06 19 48 13 87
1488:4C 8E 14 39 50 13 A2 1F C3
1490:8E 00 D6 2C 00 D6 10 FB 15
1498:8D 01 D6 60 A5 FB 85 8C 5D
14A0:A5 FC 4A 66 8C 4A 66 8C 71
14A8:4A 66 8C 85 8D A5 FD AA 23
14B0:29 0F A8 8A 4A 4A 4A 4A 49
14B8:AA 18 A5 8C 79 58 13 85 92
14C0:8C A5 8D 79 68 13 7D 78 E4
14C8:13 85 8D 60 20 DF 14 A2 DE
14D0:1F 8E 00 D6 2C 00 D6 10 B8
14D8:FB AD 01 D6 85 FA 60 A5 76
14E0:8D A2 12 8E 00 D6 2C 00 57
14E8:D6 10 FB 8D 01 D6 E8 A5 B3
14F0:8C 8E 00 D6 2C 00 D6 10 8F
14F8:FB 8D 01 D6 60 AD 31 11 3D
1500:85 FB AD 32 11 85 FC AD 0B
1508:33 11 85 FD AD 34 11 85 86
1510:FE 60 AA 08 AD 85 14 29 7C
1518:BF 28 F0 02 49 40 8D 85 56
1520:14 60 20 FD 14 A9 00 8D 25
1528:00 FF A9 01 85 83 20 91 A3
1530:17 90 05 F0 07 A9 01 60 FA
1538:A9 FE D0 FB A9 00 F0 F7 F7
1540:20 FD 14 A9 00 8D 00 FF 4D
1548:38 AD 35 11 E5 FB 85 5D 39
1550:AD 36 11 E5 FC 30 06 85 99
1558:5E A2 00 F0 12 49 FF 85 A4
1560:5E A5 5D 49 FF 69 01 85 90
1568:5D 90 02 E6 5E A2 80 38 CA
1570:AD 37 11 E5 FD 85 7A AD 68
1578:38 11 E5 FE 30 06 85 7B CF
1580:A0 00 F0 12 49 FF 85 7B 0B
1588:A5 7A 49 FF 69 01 85 7A 22
1590:90 02 E6 7B A0 80 A5 5E C8
1598:05 5D 05 7A 05 7B D0 03 9F
15A0:4C 56 14 38 A5 5D E5 7A 75
15A8:A5 5E E5 7B 90 6D A5 5D 94
15B0:85 9B 85 9E A5 5E 85 9C 6D
15B8:4A 66 9E 85 9F 8A 10 07 1C
15C0:20 88 16 98 49 80 A8 84 8B
15C8:0B 20 56 14 E6 FB D0 02 57
15D0:E6 FC 18 A5 9E 65 7A 85 10
15D8:9E A5 9F 65 7B 85 9F 38 6F
15E0:A5 9E E5 5D AA A5 9F E5 29
15E8:5E B0 14 20 56 14 A5 9B DC
15F0:D0 02 C6 9C C6 9B A5 9B 32
15F8:05 9C D0 D0 4C F2 9D 85 E2
1600:9F 86 9E 24 0B 10 0B A5 08
1608:FD D0 02 C6 FE C6 FD 4C 6F
1610:EB 15 E6 FD D0 D5 E6 FE DE
1618:4C EB 15 A5 7A 85 9B 85 09
1620:9E A5 7B 85 9C 4A 66 9E 46
1628:85 9F 98 10 07 20 88 16 F2
1630:8A 49 80 AA 86 0B 20 56 A5
1638:14 E6 FD D0 02 E6 FE 18 B6
1640:A5 9E 65 5D 85 9E A5 9F FA
1648:65 5E 85 9F 38 A5 9E E5 E4
1650:7A AA A5 9F E5 7B B0 14 A5
1658:20 56 14 A5 9B D0 02 C6 F1
1660:9C C6 9B A5 9B 05 9C D0 55
1668:D0 4C F2 9D 85 9F 86 9E 9E
1670:24 0B 10 0B A5 FB D0 02 E4
1678:C6 FC C6 FB 4C 58 16 E6 B6
1680:FB D0 D5 E6 FC 4C 58 16 E7
1688:AD 36 11 85 FC AD 35 11 AD
1690:85 FB AD 37 11 85 FD AD EF
1698:38 11 85 FE 60 A9 00 8D FC
16A0:00 FF 20 91 17 90 02 F0 D9
16A8:01 60 AD 10 12 85 24 AD C0
16B0:11 12 85 25 38 AD 12 12 9B
16B8:E9 03 85 1B AD 13 12 E9 C4
16C0:00 85 1C A2 00 86 63 86 63
16C8:64 A5 FB D0 02 C6 FC C6 09
16D0:FB 20 91 17 90 02 F0 F1 07
```

```
16D8:E6 FB D0 02 E6 FC 20 71 8E
16E0:14 C6 FD 38 A5 8C E9 50 8F
16E8:85 8C B0 02 C6 8D A5 63 4C
16F0:20 4E 17 85 63 E6 FD E6 95
16F8:FD 18 A5 8C 69 A0 85 8C 0D
1700:90 02 E6 8D A5 64 20 4E F9
1708:17 85 64 C6 FD E6 FB D0 70
1710:02 E6 FC 20 91 17 90 02 A6
1718:F0 C4 A0 02 A5 25 CD 11 92
1720:12 D0 07 A5 24 CD 10 12 51
1728:F0 21 38 A5 24 E9 03 85 CC
1730:24 B0 02 C6 25 8D 01 FF AA
1738:B1 24 99 FB 00 88 10 F8 76
1740:A9 00 8D 00 FF 20 B5 4B 2C
1748:4C C3 16 4C F2 9D 85 5D 8B
1750:20 94 17 90 19 D0 17 A5 7F
1758:5D D0 15 A0 00 A5 25 C5 BC
1760:1C 90 0E D0 06 A5 24 C5 64
1768:1B 90 06 4C 3A 4D A9 00 28
1770:60 8D 01 FF B9 FB 00 91 A1
1778:24 C8 C0 03 D0 F6 A9 00 E8
1780:8D 00 FF 18 A5 24 69 03 8A
1788:85 24 90 02 E6 25 A9 80 54
1790:60 20 9C 14 20 AE 17 90 46
1798:27 A5 FB 29 07 A8 20 CC BD
17A0:14 39 48 13 A6 83 F0 02 88
17A8:AA 60 59 48 13 60 A5 FE 58
17B0:D0 0F A9 C7 C5 FD 90 08 0C
17B8:A9 7F E5 FB A9 02 E5 FC 36
17C0:60 18 60 18 AD 20 12 6D 32
17C8:5C 11 8D 5C 11 90 03 EE A0
17D0:5D 11 A2 2D A0 2B 20 7C 87
17D8:9D B0 09 20 50 67 20 40 C5
17E0:15 4C C3 17 A0 2D 20 52 E2
17E8:67 4C 40 15 AD EC 11 8D 08
17F0:68 11 A0 00 84 9C A4 9C 28
17F8:E6 9C A9 24 A2 01 20 74 07
1800:FF A6 9E C6 9B 30 2B C9 D7
1808:0E D0 05 AD EB 11 D0 07 3B
1810:C9 8E D0 08 AD EC 11 8D 34
1818:68 11 D0 07 A4 9F 20 33 62
1820:18 E6 9F C0 4F 90 CF A0 13
1828:00 84 9F E8 86 9E E0 18 84
1830:90 C4 60 85 FA 98 48 8A 93
1838:48 0A 0A 0A 69 07 85 FD 61
1840:A9 00 85 8D 84 8C 20 AD 13
1848:14 A9 00 85 77 A5 FA 0A 97
1850:26 77 0A 0A 26 77 85 26 93
1858:A5 77 6D 68 11 85 27 A9 04
1860:00 8D 00 FF A0 07 20 DF 35
1868:14 A5 8B 0A 8D 03 FF B1 48
1870:26 90 02 49 FF A2 00 8E C5
1878:00 FF A2 1F 8E 00 D6 2C 3D
1880:00 D6 10 FB 8D 01 D6 38 7E
1888:A5 8C E9 50 85 8C B0 02 B2
1890:C6 8D 88 10 D1 68 AA 68 87
1898:A8 A5 FA 60 20 F4 87 8A 5A
18A0:D0 1D 20 FD 13 24 D7 30 6D
18A8:0E 20 5F FF 20 42 C1 2C 8D
18B0:FF 12 30 03 20 5F FF A9 C3
18B8:00 8D FF 12 4C DE 18 24 9F
18C0:D7 10 08 20 5F FF A9 80 B2
18C8:8D FF 12 20 11 14 AD FF 38
18D0:12 09 01 8D FF 12 A9 00 E0
18D8:8D 6B 11 8D 6A 11 AD FF 9E
18E0:12 F0 06 20 22 14 4C 1E 31
18E8:9E 20 42 C1 4C E6 18 20 23
18F0:A0 19 A2 01 86 83 20 86 25
18F8:03 C9 A4 F0 0B 20 32 9E 9C
1900:20 86 03 D0 03 4C 4E 14 4B
1908:20 86 03 C9 2C F0 05 C9 E1
1910:A4 F0 01 60 48 20 80 03 BD
1918:A2 04 20 70 9E 68 10 06 64
1920:20 40 15 4C 08 19 20 F2 B1
1928:9D 20 4E 14 4C 08 19 20 11
1930:A0 19 20 32 9E A2 04 20 C7
1938:52 9E 20 F2 9D 20 FD 14 EB
1940:20 1C 9E 4C 9D 16 A2 04 B0
1948:20 70 9E 20 F2 9D 4C FD 21
1950:14 20 F4 87 E0 03 B0 42 62
1958:86 77 20 09 88 CA E0 10 81
1960:B0 38 BD 4C 6A 85 FA 20 F4
1968:45 A8 A5 77 D0 12 A9 1A CF
1970:8D 00 D6 AD 01 D6 29 F0 C5
1978:05 FA 8D 01 D6 4C 97 19 DD
1980:A5 FA 0A 0A 0A 0A 85 FA A4
1988:A9 1A 8D 00 D6 AD 01 D6 0E
1990:29 0F 05 FA 8D 01 D6 4C D5
1998:1E 9E 4C 28 7D 4C DE 18 80
19A0:AD FF 12 F0 01 60 A2 23 EC
19A8:4C 3C 4D 20 32 9E A2 1F 2C
19B0:20 52 9E 20 06 9E 8C 54 75
19B8:11 8D 55 11 20 06 9E 8C 75
19C0:56 11 8D 57 11 08 A2 23 9A
19C8:20 4A 9D 28 B0 09 AD 54 2D
19D0:11 8D 56 11 AD 55 11 8D 3D
19D8:57 11 20 06 9E 8C 5C 11 50
19E0:8D 5D 11 20 06 9E 8C 5E 77
19E8:11 8D 5F 11 20 06 9E 85 DF
19F0:77 98 A4 77 20 77 9A A2 C7
19F8:2D A0 2B 20 7C 9D 90 0E DA
1A00:A9 68 A0 01 20 70 9D 9D E2
1A08:31 11 98 9D 32 11 A2 03 24
1A10:BD 54 11 9D 58 11 CA 10 E0
1A18:F7 A9 90 20 F3 9A A2 07 1D
1A20:BD 54 11 9D 60 11 CA 10 31
1A28:F7 20 50 67 20 F2 9D A2 8B
1A30:02 20 1E 9E 8A D0 03 4C 05
1A38:28 7D 8E 20 12 4C C3 17 14
1A40:A9 AD 05 04 48 20 FD 13 67
1A48:20 51 42 68 30 01 60 4C 42
1A50:CB 13 4C 28 7D 20 A0 19 02
1A58:20 32 9E 20 09 88 E0 51 7C
1A60:B0 F0 86 9F 20 09 88 E0 0B
1A68:1A B0 E7 86 9E 20 86 03 C0
1A70:D0 04 A9 00 F0 14 20 5C B7
1A78:79 A9 0F 85 02 A9 87 85 59
1A80:03 A9 7B 85 04 20 6E FF E5
1A88:A5 06 8D 03 FF 85 9B 20 60
1A90:1C 9E 8A 4A 66 8B A5 07 24
1A98:85 24 A5 08 85 25 4C EC 14
1AA0:17 85 02 A0 9B A9 13 20 D5
1AA8:E2 43 90 07 A9 27 A2 00 D0
1AB0:18 90 03 38 A5 02 4C 21 E7
1AB8:43 E0 00 D0 0F C9 28 B0 74
1AC0:0C A0 9B A9 13 84 24 85 A9
1AC8:25 18 90 01 38 4C CD 51 97
1AD0:C9 27 38 D0 1C 20 80 03 2D
1AD8:C9 FE F0 1B C9 DE 90 14 80
1AE0:C9 E9 B0 10 38 E9 DE A8 5B
1AE8:B9 85 13 48 B9 90 13 48 C0
1AF0:18 4C A9 4B 4C 6C 79 20 55
1AF8:80 03 C9 1E D0 F6 A9 1A 19
1B00:48 A9 40 48 4C F0 1A 78 24
1B08:A0 05 B9 A3 13 99 0C 03 5B
1B10:88 10 F7 58 A9 00 8D FF 7B
1B18:12 8D 6A 11 8D 6B 11 8D E2
1B20:00 FF 20 7D FF 93 12 20 C4
1B28:20 20 20 20 20 20 20 56 94
1B30:44 43 20 47 52 41 46 20 16
1B38:20 20 20 56 45 52 53 49 53
1B40:4F 4E 20 31 2E 37 32 20 9B
1B48:20 20 20 20 20 20 20 20 7E
1B50:20 20 20 20 20 20 20 20 86
1B58:20 20 20 20 20 20 20 20 8E
1B60:20 20 20 20 20 20 20 20 96
1B68:20 20 20 20 20 20 20 20 9E
1B70:20 20 20 20 20 20 20 07 8D
1B78:00 60 8A AC 4B 41 44 21 EB
```

Program 2: Clock Demo

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
KM 20 TRAP 200:PRINT"WHAT TIME
       IS IT{2 SPACES}"TI$;:IN
      PUT"{8 LEFT}";T$:IFLEN(T
      $)<>6THEN20
CM 30 TI$=T$:FAST:S=3.4:OH=0:O
      M=0:OS=0:CX=320:CY=236:C
      ALL GRAPHIC1:SCALE1,320,
      480
BM 40 WIDTH2:CALL CIRCLE 1,CX,
      CY,60*S,60*S,,,,1:CALL D
      RAW 1,CX,CY
BS 50 FORA=0TO360STEP30:CALL L
      OCATECX,CY:CALL LOCATE55
      *S;A:CALL DRAWTO5*S;A:NE
      XTA
BQ 60 FORA=0TO360STEP6:CALL LO
      CATECX,CY:CALL DRAW 1,57
      *S;A:NEXTA:Q=↑/6:TQ=3*↑/
      2
XJ 70 B=13:FORX=2*↑TOQSTEP-Q:X
      C=COS(X+TQ)*29+40:YC=SIN
      (X+TQ)*12+12:B=B-1
KB 80 B$=MID$(STR$(B),2):CALL
      {SPACE}CHAR 1,XC,YC,B$:N
      EXTX
KX 90 DO
DQ 100 T$=TI$:SEC$=RIGHT$(T$,2
      ):SEC=VAL(SEC$):IFES=SE
      CTHEN100
HX 110 ES=SEC:HR$=LEFT$(T$,2):
      HR=VAL(HR$):MIN$=MID$(T
      $,3,2):MIN=VAL(MIN$)
PJ 120 IF HR>12 THEN HR=HR-12
HM 130 IF MO<>MIN THEN MO=MIN:
      HM=0
GX 140 HA=(HR*30)+(MIN/2):MA=M
      IN*6:SA=SEC*6:IF HM THE
      N 160
MF 150 CALL DRAW 0,CX,CY TO 27
      *S;OH:CALL DRAW 0,CX,CY
       TO 48*S;OM
CX 160 CALL LOCATE CX,CY:CALL
      {SPACE}DRAW 0,49*S;OS T
      O 5*S;OS:IF HM THEN 180
SF 170 CALL DRAW 1,CX,CY TO 27
      *S;HA:CALL DRAW 1,CX,CY
       TO 48*S;MA
GX 180 CALL LOCATE CX,CY:CALL
      {SPACE}DRAW 1,49*S;SA T
      O 5*S;SA
KS 190 OH=HA:OM=MA:OS=SA:HM=-1
      :LOOP
FF 200 SCALE 0:CALL GRAPHIC 0
```

Program 3: Paint Thinner

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
EK 20 TRAP 40:FAST:CALL GRAPHI
      C 1:FORY=100TO540STEP49:
      FORX=0TO360STEPRND(0)*6+
      5
ER 30 CALL DRAW 1,Y,100 TO 98;
      X:NEXTX,Y:CALL PAINT 1,6
      39,199:GETKEY A$
SF 40 CALL GRAPHIC 0
```

Program 4: Worm Demo

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
DR 20 TRAP100:DIM XC(16),YC(16
      ),CO(15),SI(15):FAST:WA=
      ↑/4
DK 30 FORDI=0TO7:CO(DI)=INT(10
      *COS(DI*WA)):NEXTDI
AH 40 FORDI=0TO7:SI(DI)=INT(8*
      SIN(DI*WA)):NEXTDI
HP 50 XC(1)=100:YC(1)=100:DI=0
      :TA=1:CALL GRAPHIC1
BK 60 DO:WA=TA:TA=((TA+1)AND7)
      :CALLCIRCLE0,XC(TA)+64,Y
      C(TA)+36,6,4,,,,60
EK 70 CH=RND(0):IFCH<.5THENDI=
      (DI+1)AND7:ELSEDI=(DI-1)
      AND7
KG 80 X=XC(WA):Y=YC(WA):X=X+CO
      (DI):Y=Y+SI(DI):X=XAND51
      1:Y=YAND127
MP 90 XC(TA)=X:YC(TA)=Y:CALLCI
      RCLE1,X+64,Y+36,6,4,,,,6
      0:LOOP
FH 100 CALL GRAPHIC 0
```

BEFORE TYPING . . .
Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Screen Splitter

Article on page 34.

Program 1: Screen Splitter

```
QA 100 REM COPYRIGHT 1989 COMP
       UTE! PUBLICATIONS, INC.
       {2 SPACES}ALL RIGHTS RE
       SERVED.
MH 110 GOSUB1560:GOTO1270
DJ 120 SYS52736:CLR:POKE53082,
       1:POKE53083,51
AA 130 INPUT"{8}{CLR}{DOWN}# O
       F SCREEN AREAS (2-100)"
       ;PA
JP 140 IFPA<2ORPA>100THEN130
XF 150 DIMPA(PA):PA(PA)=51
RA 160 PRINT"{CLR}"TAB(15)"{8}
       {3 DOWN}VALUE:"
RP 170 PRINTTAB(12)"{3 DOWN}
       {RVS} CRSR {OFF} MOVE A
       REA":PRINTTAB(12)"
       {DOWN}{RVS} RETURN
       {OFF} CONFIRM"
GJ 180 PRINTTAB(12)"{DOWN}
       {RVS} E {OFF} EXIT TO M
       ENU"
JH 190 FORA=1102TO1982STEP80:P
       OKEA,224:NEXT
AX 200 PRINT"{HOME}":FORA=2TO2
       2STEP2:PRINTA"{DOWN}":N
       EXT:PRINT" 24{HOME}"
XF 210 FORC=PA-1TO1STEP-1
XC 220 PRINT"{HOME}{8}{2 DOWN}
       "TAB(12)"DEFINE AREA #"
       PA-C
PJ 230 Y=PA(C+1)
GA 240 GOSUB370
PK 250 PA(C)=Y:NEXT
RQ 260 PA(PA)=0
AA 270 FORC=1TOPA-1:PA(C)=PA(C
       )+1:NEXT
HK 280 SYS52736
SR 290 PRINT"{CLR}{2 DOWN}
       {2 RIGHT}{8}NUMBER OF A
       REAS:{WHT}"PA"{DOWN}"
MA 300 FORC=1TOPA-1:PRINT"{8}
       {3 SPACES}AREA #"C"
       {LEFT}:{WHT}"PA(PA+1-C)
       "TO"PA(PA+1-(C+1))-1:NE
       XT
EF 310 PRINT"{8}{3 SPACES}AREA
        #"PA"{LEFT}:{WHT}"PA(1
       )"UP TO THE END."
MC 320 INPUT"{8}{DOWN}
       {2 SPACES}ARE YOU SURE
       {SPACE}(Y/N/E)
       {2 SPACES}Y{3 LEFT}";A$
JH 330 IFA$="Y"THEN500
KX 340 IFA$="N"THEN120
RP 350 IFA$="E"THEN1270
SR 360 GOTO290
DB 370 SYS52992
GE 380 IFY=254ANDC<PATHEN120
GB 390 IFC<PA-1THENPOKE53082,Y
       :POKE53083,Y+1:Y=Y+1
CA 400 GETA$
XB 410 IFA$="{DOWN}"THENY=Y+1:
       POKE53083,PEEK(53083)+1
RM 420 IFA$="{UP}"THENY=Y-1:PO
       KE53083,PEEK(53083)-1
RD 430 IFA$=CHR$(13)THENRETURN
GQ 440 IFA$="E"THEN1270
CA 450 IFY=1THENY=2:POKE53083,
       2
FS 460 IFY=255THENY=254:POKE53
       083,254
FA 470 IFC<PA-1THENIFY=PA(C+1)
       THENY=Y+1:POKE53083,PEE
       K(53083)+1
GS 480 PRINT"{HOME}{3 DOWN}"TA
       B(21)Y"{LEFT} "
HB 490 GOTO400
GK 500 INPUT"{CLR}{DOWN} HOW M
       ANY ADDRESSES ARE YOU P
       OKING";RE:IFRE<1 OR RE>
       255THEN500
HG 510 INPUT"{DOWN} ARE YOU SU
       RE (Y/N/E){2 SPACES}Y
       {3 LEFT}";A$
MB 520 IFA$="E"THEN1270
EJ 530 IFA$="N"THEN500
FQ 540 IFA$<>"Y"THENPRINT"
       {3 UP}":GOTO510
BP 550 DIMRE(RE,PA)
DJ 560 PRINT:FORC=1TORE
ES 570 PRINT"{CLR}{DOWN} ADDRE
       SS #"C;:INPUTRE(C,0)
SD 580 IFRE(C,0)<0ORRE(C,0)>65
       535THEN570
QG 590 PRINT:FORB=1TOPA
QD 600 PRINT"{2 SPACES}VALUE O
       F"RE(C,0)"FOR AREA #"B;
       :INPUT RE(C,B)
AE 610 IF RE(C,B)<0 OR RE(C,B)
       >255 THENPRINT"{2 UP}":
       GOTO600
KJ 620 NEXT
MR 630 INPUT"{2 DOWN} ARE YOU
       {SPACE}SURE (Y/N/E)
       {2 SPACES}Y{3 LEFT}";A$
XP 640 IFA$="N"THEN570
RS 650 IFA$="E"THEN1270
FS 660 IFA$<>"Y"THENPRINT"
       {3 UP}":GOTO630
FP 670 NEXT
PA 680 PRINT"{CLR}{DOWN} ARE Y
       OU USING ANOTHER IRQ":I
       NPUT" ROUTINE (Y/N/E)
       {2 SPACES}N{3 LEFT}";A$
EK 690 IFA$="N"THEN740
EQ 700 IFA$="E"THEN1270
MR 710 IFA$<>"Y"THEN680
DG 720 INPUT"{DOWN} ADDRESS OF
        THE JUMP";RS
GP 730 IF RS<0 OR RS>65535 THE
       NPRINT"{4 UP}":GOTO720
CJ 740 PRINT"{CLR}{DOWN} WAIT
       {SPACE}A MOMENT, PLEASE
       ..."
MF 750 POKE 49182,PA
DB 760 POKE 49223,PA-1
AC 770 DI=49231
CF 780 FORC=1 TO RE
AP 790 POKE DI,141:DI=DI+1
DH 800 POKE DI,RE(C,0)-INT(RE(
       C,0)/256)*256:DI=DI+1
KG 810 POKE DI,INT(RE(C,0)/256
       )
SH 820 DI=DI+4:NEXT
XK 830 POKE DI,141:DI=DI+1
HS 840 POKE DI,018:DI=DI+1
RQ 850 POKE DI,208:DI=DI+1
DC 860 POKE DI,138:DI=DI+1
RS 870 POKE DI,240:DI=DI+1
BR 880 POKE DI,006:DI=DI+1
QR 890 POKE DI,104:DI=DI+1
AG 900 POKE DI,168:DI=DI+1
DR 910 POKE DI,104:DI=DI+1
QC 920 POKE DI,170:DI=DI+1
JD 930 POKE DI,104:DI=DI+1
BH 940 POKE DI,064:DI=DI+1
HE 950 POKE DI,076:DI=DI+1
PF 960 IF RS=0 THEN POKE DI,49
       :POKE DI+1,234:DI=DI+2:
       GOTO990
SH 970 POKE DI,RS-INT(RS/256)*
       256:DI=DI+1
HG 980 POKE DI,INT(RS/256):DI=
       DI+1
XG 990 DD=DI:DI=49228
GJ 1000 FOR C=1 TO RE
XF 1010 POKE DI,189:DI=DI+1
MJ 1020 B=DD+C*PA
HS 1030 POKE DI,B-INT(B/256)*2
       56:DI=DI+1
SG 1040 POKE DI,INT(B/256)
FJ 1050 DI=DI+4:NEXTC
AC 1060 POKE DI,189:DI=DI+1
PR 1070 POKE DI,DD-INT(DD/256)
       *256:DI=DI+1
PB 1080 POKE DI,INT(DD/256)
DF 1090 POKE 49191,DD-INT(DD/2
       56)*256
MD 1100 POKE 49192,INT(DD/256)
HS 1110 FORC=1TOPA
HA 1120 POKE DD+C-1,ABS(PA(C)-
       1)
RQ 1130 NEXT C
XP 1140 DD=DD+PA
QG 1150 FORC=1 TO RE
DS 1160 FORB=PA-1 TO 1 STEP-1
MX 1170 POKE DD,RE(C,B):DD=DD+
       1
RQ 1180 NEXT
QA 1190 POKE DD,RE(C,PA):DD=DD
       +1
XQ 1200 NEXT
AJ 1210 POKE49168,DD-INT(DD/25
       6)*256:POKE49169,INT(D
       D/256)
CK 1220 PRINT"{DOWN}{WHT}
       {RVS} READY {OFF}"
JC 1230 PRINT"{DOWN}{8} THE RO
       UTINE STARTS IN: {WHT}
       49170"
FP 1240 PRINT"{DOWN} {8}AND EN
       DS IN:{WHT}"DD
PG 1250 PRINT"{2 DOWN}{WHT} PR
       ESS ANY KEY TO CONTINU
       E"
EB 1260 POKE198,0:WAIT 198,1
GF 1270 CLR:SYS52736
GX 1280 PRINT"{CLR}{8}{DOWN}
       {11 RIGHT}{RVS} SCREEN
        SPLITTER {OFF}"
SS 1290 PRINTTAB(8)"{3 DOWN}
       {WHT}F1{8}. CREATE INT
       ERRUPT"
FD 1300 PRINTTAB(8)"{DOWN}
       {WHT}F3{8}. TURN ON"
AK 1310 PRINTTAB(8)"{DOWN}
       {WHT}F4{8}. TURN OFF"
SP 1320 PRINTTAB(8)"{DOWN}
       {WHT}F5{8}. SAVE INTER
       RUPT"
JP 1330 PRINTTAB(8)"{DOWN}
       {WHT}F7{8}. END"
GB 1340 PRINTTAB(10)"{3 DOWN}
       {WHT}SELECT YOUR OPTIO
       N"
EH 1350 GETA$:IFA$=""THEN1350
SE 1360 IFA$="{F1}"THEN120
DQ 1370 IFA$="{F3}"THENSYS4917
       0
MM 1380 IFA$="{F4}"THENSYS5273
       6:GOTO1270
DX 1390 IFA$="{F5}"THEN1420
FS 1400 IFA$="{F7}"THEN1520
MP 1410 GOTO1350
KM 1420 SYS52736
EM 1430 INPUT"{CLR}{DOWN}{8} N
       AME ";N$:IF N$="" THEN
       1270
SK 1440 N$=LEFT$(N$,16)
```

```
RF 1450 PRINT"{DOWN}{WHT} SAVI
        NG..."
KM 1460 FORT=1TOLEN(N$):POKE49
        151+T,ASC(MID$(N$,T,1)
        ):NEXT
RG 1470 POKE780,LEN(N$):POKE78
        1,0:POKE782,192:SYS654
        69
SF 1480 POKE780,1:POKE781,8:PO
        KE782,255:SYS65466
KX 1490 POKE251,16:POKE252,192
CX 1500 POKE780,251:POKE781,PE
        EK(49168):POKE782,PEEK
        (49169):SYS65496
HA 1510 GOTO1270
XX 1520 INPUT"{DOWN}{8} ARE YO
        U SURE (Y/N){2 SPACES}
        Y{3 LEFT}";A$
BD 1530 IFA$="Y"THENEND
BC 1540 IFA$="N"THEN1270
ME 1550 PRINT"{3 UP}":GOTO1520
GX 1560 FORA=52992TO53085:READ
        N:POKEA,N:POKEA-3822,N
        :NEXT
EP 1570 FORA=52736TO52756:READ
        N:POKEA,N:NEXT
RB 1580 POKE49197,56:POKE49202
        ,192:POKE49229,104:POK
        E49230,192
GA 1590 POKE49235,102:POKE4923
        6,192:RETURN
DH 1600 DATA 120,169,127,141,1
        3,220,169,1,141,26,208
        ,169,2,133,2,169,27,14
        1
DC 1610 DATA 17,208,173,97,192
        ,141,18,208,169,38,141
        ,20,3,169,207,141,21,3
BJ 1620 DATA 88,96,173,25,208,
        141,25,208,41,1,240,25
        ,198,2,16,4,169,1,133
GG 1630 DATA 2,166,2,189,92,20
        7,141,33,208,189,90,20
        7,141,18,208,138,240,6
SD 1640 DATA 104,168,104,170,1
        04,64,76,49,234,0,0,1,
        2,0,1,234,0,1,2,0,1
KX 1650 DATA 120,169,49,141,20
        ,3,169,234,141,21,3,32
        ,129,255
GB 1660 DATA 88,169,0,141,33,2
        08,96
```

Program 2: RainbowBorder

```
C010:96 C0 78 A9 7F 8D 0D DC DF
C018:A9 01 8D 1A D0 A9 19 85 E6
C020:02 A9 1B 8D 11 D0 AD 64 D4
C028:C0 8D 12 D0 A9 38 8D 14 1A
C030:03 A9 C0 8D 15 03 58 60 54
C038:AD 19 D0 8D 19 D0 29 01 29
C040:F0 19 C6 02 10 04 A9 18 75
C048:85 02 A6 02 BD 7D C0 8D F4
C050:20 D0 BD 64 C0 8D 12 D0 45
C058:8A F0 06 68 A8 68 AA 68 47
C060:40 4C 31 EA F2 EA E2 DA CD
C068:D2 CA C2 BA B2 AA A2 9A 2A
C070:92 8A 82 7A 72 6A 62 5A 32
C078:52 4A 42 3A 01 07 09 02 D9
C080:04 0E 06 05 07 09 02 04 FC
C088:0E 06 05 07 09 02 04 0E 0A
C090:06 05 07 09 02 05 00 00 EB
```

Program 3: MultiSprite

```
C010:B2 C0 78 A9 7F 8D 0D DC ED
C018:A9 01 8D 1A D0 A9 04 85 BC
C020:02 A9 1B 8D 11 D0 AD 8E FE
C028:C0 8D 12 D0 A9 38 8D 14 1A
C030:03 A9 C0 8D 15 03 58 60 54
C038:AD 19 D0 8D 19 D0 29 01 29
C040:F0 19 C6 02 10 04 A9 03 60
C048:85 02 A6 02 BD 92 C0 8D 49
C050:01 D0 BD 96 C0 8D 03 D0 BA
C058:BD 9A C0 8D 05 D0 BD 9E D5
C060:C0 8D 07 D0 BD A2 C0 8D 1B
C068:09 D0 BD A6 C0 8D 0B D0 E7
C070:BD AA C0 8D 0D D0 BD AE 42
C078:C0 8D 0F D0 BD 8E C0 8D E3
C080:12 D0 8A F0 06 68 A8 68 2B
C088:AA 68 40 4C 31 EA C2 92 93
C090:63 01 97 68 37 C7 97 68 ED
C098:37 C7 97 68 37 C7 97 68 91
C0A0:37 C7 97 68 37 C7 97 68 99
C0A8:37 C7 97 68 37 C7 97 68 A1
C0B0:37 C7 00 00 00 00 00 00 BF
```

Program 4: TextHires

```
C010:70 C0 78 A9 7F 8D 0D DC CC
C018:A9 01 8D 1A D0 A9 02 85 B8
C020:02 A9 1B 8D 11 D0 AD 6A DA
C028:C0 8D 12 D0 A9 38 8D 14 1A
C030:03 A9 C0 8D 15 03 58 60 54
C038:AD 19 D0 8D 19 D0 29 01 29
C040:F0 19 C6 02 10 04 A9 01 5E
C048:85 02 A6 02 BD 6C C0 8D B0
C050:18 D0 BD 6E C0 8D 11 D0 DF
C058:BD 6A C0 8D 12 D0 8A F0 1E
C060:06 68 A8 68 AA 68 40 4C 5E
C068:31 EA D2 01 1D 15 3B 1B 76
```

Program 5: Demo

```
HJ 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC.
      {2 SPACES}ALL RIGHTS RES
      ERVED.
HG 20 ON A GOTO110,210,310
HR 30 FORI=52736TO52751:READN:
      POKEI,N:NEXT
AR 40 DATA 120,169,49,141,20,3
      ,169,234,141,21,3,32,129
      ,255,88,96
EP 50 SYS52736:A=1:LOAD"RAINBO
      WBORDER",8,1
BP 60 SYS52736:A=2:LOAD"MULTIS
      PRITE",8,1
QR 70 SYS52736:A=3:LOAD"TEXTHI
      RES",8,1
RB 100 REM RAINBOW BORDER DEMO
AF 110 SYS49170:REM TURN ON IN
       T
HD 120 PRINT"{CLR}{2 DOWN}";TA
       B(12)"RAINBOW BORDER":G
       OSUB440:GOTO60
AG 200 REM MULTISPRITE DEMO
MP 210 FOR I=832 TO 895:POKE I
       ,0:NEXT
RJ 220 FOR I=2040 TO 2047:POKE
        I,13:NEXT
GH 230 FOR I=832 TO 865 STEP 3
       :POKE I,255:POKEI+1,127
       :NEXT
CG 240 V=53248:FOR I=0 TO 14 S
       TEP 2:POKE I+V,I*15+40:
       NEXT
CC 250 POKE V+21,255:SYS49170
CR 260 PRINT"{CLR}{3 DOWN}"TAB
       (15)"MULTISPRITE":GOSUB
       440:GOTO70
KB 300 REM HIRES WITH TEXT WIN
       DOW
MC 310 FOR I=0 TO 7:BI(I)=2↑I:
       NEXT
DS 320 BASE=8192:POKE 53272,PE
       EK(53272)OR8
EQ 330 A$="":FOR I=1 TO 38:A$=
       A$+"0":NEXT:PRINTCHR$(1
       9);
HP 340 FOR I=1 TO 21:PRINTA$;:
       NEXT:POKE 2023,PEEK(202
       2):REM SET COLOR MAP
BB 350 A$="":FOR I=1 TO 128:A$
       =A$+"@":NEXT:FOR I=32 T
       O 63 STEP 2
AQ 360 POKE 648,I:PRINTCHR$(19
       );A$;A$;A$:NEXT:POKE
       648,4:SYS49170
PJ 370 FOR Y=0TO160
CR 380 X=INT(160+40*SIN(Y/10))
       :REM SINE WAVE
ER 390 BY=BASE+40*(Y AND 248)+
       (Y AND 7)+(X AND 504)
ES 400 POKE BY,PEEK(BY) OR (BI
       (NOT X AND 7)):NEXT Y
HH 410 PRINT"{HOME}{20 DOWN}"
BM 420 PRINTTAB(7)"BOTTOM FOUR
        LINES ARE TEXT"
BP 430 GOSUB440:SYS52736:END
CG 440 PRINT:PRINTTAB(9)"SPACE
        BAR TO CONTINUE"
BQ 450 GETA$:IF A$=" " THEN RE
       TURN
SC 460 GOTO450
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Disk Doubler

Article on page 46.

```
FF 5 REM COPYRIGHT 1989 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
SP 10 PRINT"{CLR}":POKE53280,6
      :POKE53281,6
HE 20 PRINT"{HOME}{RVS}{YEL}
      {13 SPACES}DISK DOUBLER
      {15 SPACES}"
KR 30 PRINTTAB(12)"{DOWN}COPYR
      IGHT 1989":PRINTTAB(7)"C
      OMPUTE! PUBLICATIONS, IN
      C."
AA 40 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
JH 50 PRINT"{2 DOWN}{WHT}INSER
      T SINGLE-SIDED DISK (LAB
      EL UP)"
QX 60 PRINT"AND PRESS RETURN T
      O CONVERT IT TO A":PRINT
      "DOUBLE-SIDED DISK."
BJ 70 GETA$:IFA$<>CHR$(13)THEN
      70
MK 80 GOSUB 130
DH 90 A$="":PRINT:PRINT"CHANGE
       ANOTHER? (Y/N) "
SB 100 GETA$:IFA$<>"Y"ANDA$<>"
       Y"ANDA$<>"N"ANDA$<>"N"T
       HEN100
EQ 110 PRINTA$:IF A$="Y"ORA$="
       Y"THENRUN
XS 120 PRINT"{CLR}":END
GQ 130 OPEN15,8,15,"I0":PRINT#
       15,"U0>M1"
EB 140 OPEN5,8,5,"#":REM OPEN
       {SPACE}DIRECT ACCESS CH
       NL
QQ 150 PRINTCHR$(147):PRINT"RE
       ADING SIDE ONE BAM...
EF 160 PRINT#15,"U1";5;0;18;0:
       REM READ TRACK 18 SECTO
       R 0 INTO BUFFER
AS 170 PRINT#15,"B-P";5;3:REM
       {SPACE}POINT TO BYTE 3
       {SPACE}OF BUFFER
AX 180 GET#5,A$:IF ASC(A$+CHR$
       (0))=128 THEN 510
GC 190 PRINT"CHANGING SIDE ONE
        BAM...
AB 200 PRINT#15,"B-P";5;3:REM
```

```
        {SPACE}POINT TO BYTE 3
        {SPACE}OF BUFFER
JQ 210 PRINT#5,CHR$(128);:REM
        {SPACE}CHANGE BYTE 3 TO
        FLAG DOUBLE SIDED DISK
PH 220 FOR I=221TO237:PRINT#15
        ,"B-P";5;I:PRINT#5,CHR$
        (21);:NEXT
GQ 230 PRINT#15,"B-P";5;238:PR
        INT#5,CHR$(0);
EA 240 FOR I=239TO244:PRINT#15
        ,"B-P";5;I:PRINT#5,CHR$
        (19);:NEXT
MJ 250 FOR I=245TO250:PRINT#15
        ,"B-P";5;I:PRINT#5,CHR$
        (18);:NEXT
BK 260 FOR I=251TO255:PRINT#15
        ,"B-P";5;I:PRINT#5,CHR$
        (17);:NEXT
QF 270 PRINT"WRITING MODIFIED
        {SPACE}SIDE ONE BAM...
XR 280 PRINT#15,"U2";5;0;18;0
XA 290 CLOSE5
FK 300 PRINT"FORMATTING SECOND
        SIDE...
KA 310 OPEN1,8,15:PRINT#1,"M-E
        " CHR$(69) CHR$(164):CL
        OSE1:REM FORMAT SIDE 2
AQ 320 PRINT#15,"I0"
DB 330 OPEN5,8,5,"#"
KH 340 PRINT"READING NEW SIDE
        {SPACE}TWO BAM...
DB 350 PRINT#15,"U1";5;0;53;0:
        REM GET SIDE 2 BAM INTO
        BUFFER
SD 360 PRINT"CHANGING SIDE TWO
        BAM...
GM 370 FOR I=0TO104:PRINT#15,"
        B-P";5;I:PRINT#5,CHR$(2
        55);:NEXT
XS 380 FOR I=2TO50STEP3:PRINT#
        15,"B-P";5;I:PRINT#5,CH
        R$(31);:NEXT
SC 390 FOR I=51TO53:PRINT#15,"
        B-P";5;I:PRINT#5,CHR$(0
        );:NEXT
GB 400 FOR I=56TO71STEP3:PRINT
        #15,"B-P";5;I:PRINT#5,C
        HR$(7);:NEXT
BE 410 FOR I=74TO89STEP3:PRINT
        #15,"B-P";5;I:PRINT#5,C
        HR$(3);:NEXT
RG 420 FORI=92TO104STEP3:PRINT
        #15,"B-P";5;I:PRINT#5,C
        HR$(1);:NEXT
MC 430 FORI=104TO255:PRINT#15,
        "B-P";5;I:PRINT#5,CHR$(
        0);:NEXT
QK 440 PRINT"WRITING NEW SIDE
        {SPACE}TWO BAM...
ES 450 PRINT#15,"U2";5;0;53;0:
        REM WRITE THE BUFFER BA
        CK TO DISK
RP 460 PRINT"INITIALIZING DRIV
        E...
HC 470 CLOSE5:PRINT#15,"I0"
CC 480 PRINT"VALIDATING DISK..
        .
DF 490 PRINT#15,"V0"
GE 500 CLOSE15:RETURN
RB 510 PRINT"{RVS}DISK IS ALRE
        ADY DOUBLE-SIDED":CLOSE
        5:CLOSE15:RETURN
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Sprite Clock

Article on page 44.

```
FH 10 REM COPYRIGHT 1989 COMPU
        TE! PUBLICATIONS, INC. -
        ALL RIGHTS RESERVED

EF 20 PRINT"{CLR}{DOWN}
        {3 SPACES}COPYRIGHT 1989
        COMPUTE! PUB., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
        {SPACE}RESERVED"
EF 40 GOSUB110
JX 50 C=0:INPUT"{DOWN}HOUR,MIN
        ,AM/PM";H,M,A$
GG 60 A$=LEFT$(A$,1):IFH<0ORH>
        12ORM<0ORM>59OR(A$<>"A"A
        NDA$<>"P")THEN50
DX 70 POKE960,INT(H/10)*16+H-I
        NT(H/10)*10:IFA$="P"THEN
        C=128
KJ 80 POKE961,(INT(M/10)*16+M-
        INT(M/10)*10):IFH=12THEN
        C=128-C
PD 90 POKE960,PEEK(960)AND127:
        POKE960,PEEK(960)ORC
XQ 100 SYS962:END
JK 110 FORI=960TO1017:READA:X=
        X+A:POKEI,A:NEXT
QP 120 FORI=40960TO41262:READA
        :X=X+A:POKEI,A:NEXT
AJ 130 IFX<>37842THENPRINT"
        {DOWN}ERROR IN DATA STA
        TEMENTS.":STOP
CS 140 RETURN
XE 150 REM DRIVER
FR 160 DATA 18,0,32,232,3,32
KB 170 DATA 16,160,76,232,3,17
        3
EA 180 DATA 193,3,205,10,220,2
        40
FH 190 DATA 9,32,232,3,32,146
CK 200 DATA 160,32,232,3,76,49
AM 210 DATA 234,32,232,3,32,22
        6
KF 220 DATA 160,76,232,3,165,1
DS 230 DATA 73,1,133,1,96,32
AE 240 DATA 232,3,169,0,32,36
AF 250 DATA 160,76,232,3
ER 260 REM CLOCK DISPLAY
AG 270 DATA 1,1,0,0,0,1
BM 280 DATA 2,64,65,66,24,25
CB 290 DATA 26,88,89,90,173,19
        2
PJ 300 DATA 3,141,11,220,173,1
        93
RM 310 DATA 3,141,10,220,169,0
BF 320 DATA 141,9,220,141,8,22
        0
AE 330 DATA 168,153,64,3,200,1
        92
GX 340 DATA 128,208,248,173,21
        ,208
XB 350 DATA 9,192,141,21,208,1
        73
DH 360 DATA 16,208,9,128,141,1
        6
GX 370 DATA 208,169,248,141,12
        ,208
AP 380 DATA 169,40,141,14,208,
        173
GP 390 DATA 134,2,141,45,208,1
        41
AJ 400 DATA 46,208,169,234,141
        ,13
GD 410 DATA 208,141,15,208,169
        ,192
HF 420 DATA 141,23,208,141,29,
        208
XB 430 DATA 162,13,142,254,7,2
        32
AM 440 DATA 142,255,7,173,20,3
QP 450 DATA 201,203,208,10,173
        ,21
GX 460 DATA 3,201,3,208,3,76
DK 470 DATA 146,160,173,20,3,1
        41
JQ 480 DATA 221,3,173,21,3,141
RR 490 DATA 222,3,120,169,203,
        141
DQ 500 DATA 20,3,169,3,141,21
CP 510 DATA 3,88,173,11,220,14
        1
GJ 520 DATA 192,3,173,10,220,1
        41
QR 530 DATA 193,3,173,8,220,16
        2
DX 540 DATA 1,173,192,3,16,2
RC 550 DATA 162,16,142,1,160,1
        62
BH 560 DATA 5,142,0,160,32,226
PR 570 DATA 160,162,0,142,0,16
        0
JS 580 DATA 173,192,3,41,127,3
        2
HJ 590 DATA 205,160,162,58,142
        ,1
BQ 600 DATA 160,32,226,160,173
        ,193
CE 610 DATA 3,72,74,74,74,74
SK 620 DATA 9,48,141,1,160,32
DJ 630 DATA 226,160,104,41,15,
        9
KH 640 DATA 48,141,1,160,172,0
KQ 650 DATA 160,185,4,160,141,
        3
XB 660 DATA 160,173,1,160,170,
        74
XP 670 DATA 74,74,74,74,9,208
HH 680 DATA 141,13,161,138,10,
        10
XM 690 DATA 10,141,12,161,160,
        0
ED 700 DATA 140,2,160,165,1,41
SP 710 DATA 251,133,1,185,0,20
        8
FG 720 DATA 172,3,160,153,64,3
MG 730 DATA 200,200,200,140,3,
        160
HE 740 DATA 172,2,160,200,140,
        2
ER 750 DATA 160,192,8,208,230,
        165
EP 760 DATA 1,9,4,133,1,238
PE 770 DATA 0,160,96
```

Notepad 128

See instructions in article on page 47 before typing in.

```
1300:A9 00 8D 00 FF A9 93 20 9A
1308:D2 FF 20 8A 14 A9 4C 8D B1
1310:90 03 A9 30 8D 91 03 A9 D9
1318:13 8D 92 03 A9 EA 8D 93 55
1320:03 A2 00 BD 42 16 F0 07 9F
1328:20 D2 FF E8 4C 23 13 60 17
1330:CD 3E 16 F0 08 C9 3A B0 2B
1338:03 4C 94 03 60 A9 00 8D EC
1340:00 FF AA BD 3F 16 8D 20 25
1348:D0 E8 BD 3F 16 8D 21 D0 B6
1350:E8 BD 3F 16 85 F1 A2 00 DC
1358:BD 47 15 F0 07 20 D2 FF 3F
1360:E8 4C 58 13 20 E4 FF F0 CF
1368:FB C9 31 F0 1F C9 32 F0 A9
1370:1E C9 33 F0 1D C9 34 F0 F6
1378:1C C9 35 F0 1B C9 42 F0 4A
1380:1A C9 53 F0 22 C9 43 F0 4F
1388:2A 4C 64 13 4C BD 13 4C 60
1390:C8 13 4C C4 14 4C FA 14 91
1398:4C 82 14 EE 20 D0 AD 20 B6
13A0:D0 8D 3F 16 4C 64 13 EE E4
13A8:21 D0 AD 21 D0 8D 40 16 AE
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13B0:4C 64 13 E6 F1 A5 F1 8D 7E
13B8:41 16 4C 3D 13 20 9E 14 CC
13C0:20 E4 FF F0 FB 4C 3D 13 DD
13C8:A9 93 20 D2 FF 20 9E 14 AB
13D0:20 17 14 20 E4 FF F0 FB 56
13D8:C9 5F F0 09 8D 9B 16 20 91
13E0:F2 13 4C D3 13 AD 9F 16 B0
13E8:A0 00 91 FB 20 8A 14 4C F0
13F0:3D 13 AD 9F 16 A0 00 91 EE
13F8:FB AD 9B 16 20 D2 FF 38 E1
1400:20 F0 FF 86 FD 84 FE 20 FC
1408:2C 14 A0 00 B1 FB 8D 9F 97
1410:16 18 69 80 91 FB 60 A9 65
1418:00 85 FB A9 04 85 FC A0 8C
1420:00 B1 FB 8D 9F 16 18 69 FB
1428:80 91 FB 60 A5 FE C9 28 5F
1430:90 05 38 E9 28 85 FE A9 86
1438:00 8D 9C 16 8D 9D 16 A5 6D
1440:FD 8D 9E 16 A0 27 A9 00 F4
1448:18 AD 9C 16 6D 9E 16 8D 7C
1450:9C 16 AD 9D 16 69 00 8D BF
1458:9D 16 88 10 EC 18 AD 9C A6
1460:16 65 FE 8D 9C 16 AD 9D DB
1468:16 69 00 8D 9D 16 18 AD F1
1470:9D 16 69 04 8D 9D 16 AD 17
1478:9C 16 85 FB AD 9D 16 85 7A
1480:FC 60 A9 93 20 D2 FF 4C 46
1488:37 4D 20 B2 14 A2 04 B1 B3
1490:FB 91 FD C8 D0 F9 E6 FC A0
1498:E6 FE CA 10 F2 60 20 B2 5A
14A0:14 A2 04 B1 FD 91 FB C8 0E
14A8:D0 F9 E6 FC E6 FE CA 10 3D
14B0:F2 60 A9 00 85 FB A8 A9 B6
14B8:04 85 FC A9 A0 85 FD A9 3F
14C0:16 85 FE 60 A2 00 BD 79 45
14C8:16 F0 07 20 D2 FF E8 4C CF
14D0:C6 14 20 24 15 98 A2 59 51
14D8:A0 16 20 BD FF A9 00 A2 FF
14E0:08 A0 00 20 BA FF A9 A0 01
14E8:85 FD A9 16 85 FE A9 FD 63
14F0:A2 88 A0 1A 20 D8 FF 4C F2
14F8:3D 13 A2 00 BD 8A 16 F0 0E
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1508:20 24 15 98 A2 59 A0 16 49
1510:20 BD FF A9 00 A2 08 A0 8F
1518:FF 20 BA FF A9 00 20 D5 05
1520:FF 4C 3D 13 A2 00 BD 69 30
1528:16 F0 07 20 D2 FF E8 4C 31
1530:26 15 A0 00 20 CF FF C9 D0
1538:0D F0 0B 99 59 16 C8 C0 95
1540:10 F0 03 4C 34 15 60 93 1E
1548:12 20 20 20 20 20 20 20 6B
1550:20 20 20 20 20 20 20 4E A8
1558:4F 54 45 50 41 44 20 31 79
1560:32 38 20 20 20 20 20 20 99
1568:20 20 20 20 20 20 20 20 92
1570:20 92 0D 0D 0D 0D 20 20 BE
1578:20 20 20 20 20 20 20 20 A2
1580:20 20 20 20 31 2D 56 49 FC
1588:45 57 20 4E 4F 54 45 53 BD
1590:0D 20 20 20 20 20 20 20 31
1598:20 20 20 20 20 20 20 32 D4
15A0:2D 45 4E 54 45 52 20 4E C3
15A8:4F 54 45 53 0D 20 20 20 B6
15B0:20 20 20 20 20 20 20 20 DA
15B8:20 20 20 33 2D 53 41 56 C1
15C0:45 20 4E 4F 54 45 53 0D BF
15C8:20 20 20 20 20 20 20 20 F2
15D0:20 20 20 20 20 20 34 2D 30
15D8:4C 4F 41 44 20 4E 4F 54 96
15E0:45 53 0D 20 20 20 20 20 08
15E8:20 20 20 20 20 20 20 20 13
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15F8:0D 0D 0D 20 20 59 4F 55 EA
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1630:52 41 43 54 45 52 20 43 7A
1638:4F 4C 4F 52 92 00 5F 00 81
1640:00 01 4E 4F 54 45 50 41 05
1648:44 20 31 32 38 20 41 43 EF
1650:54 49 56 41 54 45 44 0D 25
1658:00 00 00 00 00 00 00 00 84
1660:00 00 00 00 00 00 00 00 8C
1668:00 45 4E 54 45 52 20 46 EE
1670:49 4C 45 4E 41 4D 45 3E E9
1678:00 93 12 20 53 41 56 45 5F
1680:20 46 49 4C 45 20 92 0D 19
1688:0D 00 93 12 20 4C 4F 41 E0
1690:44 20 46 49 4C 45 20 92 8E
1698:0D 0D 00 00 00 00 00 00 8E
16A0:00 00 00 00 00 00 00 00 CC
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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it. **G**

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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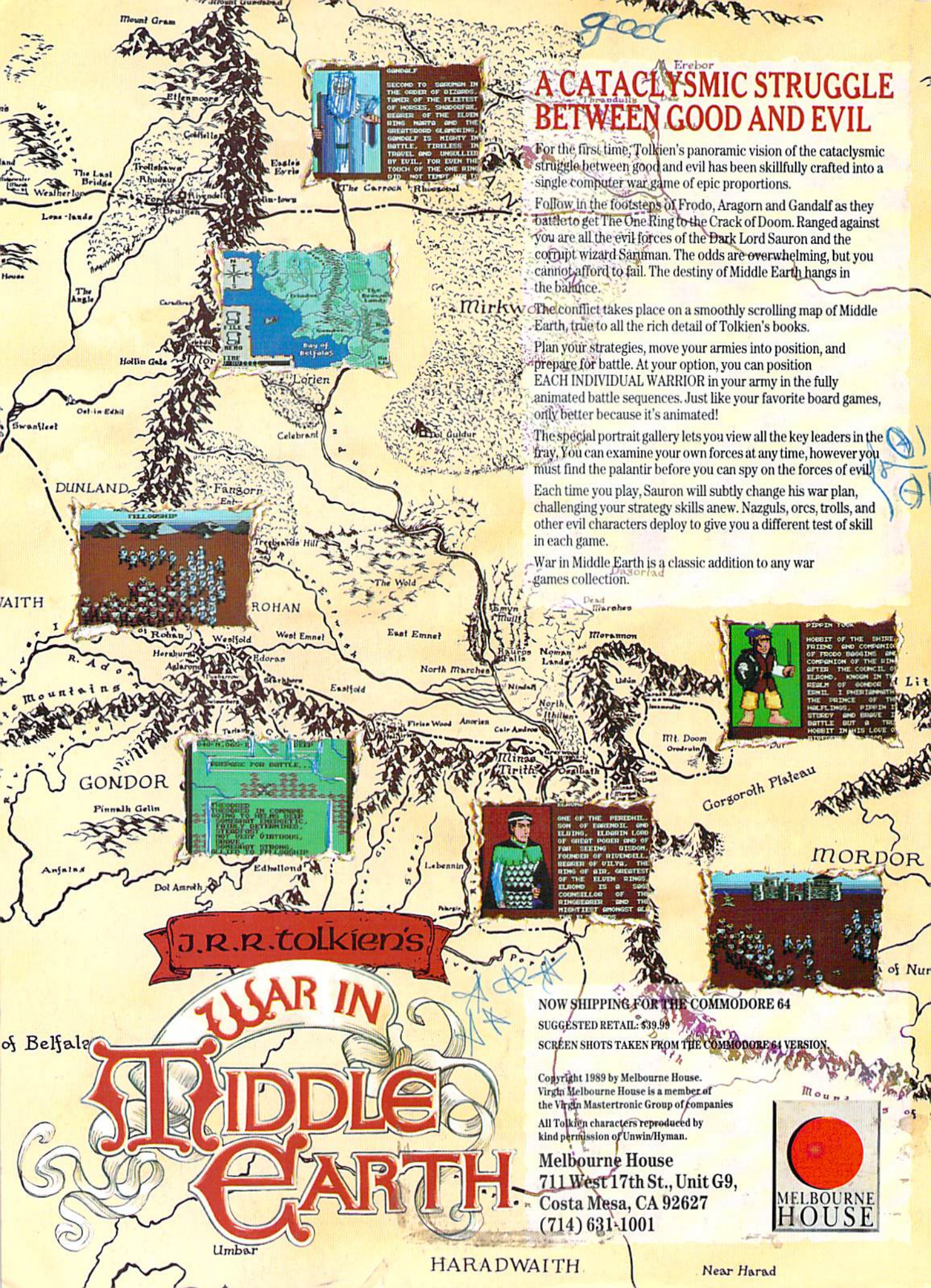

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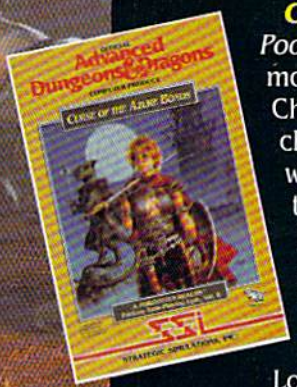

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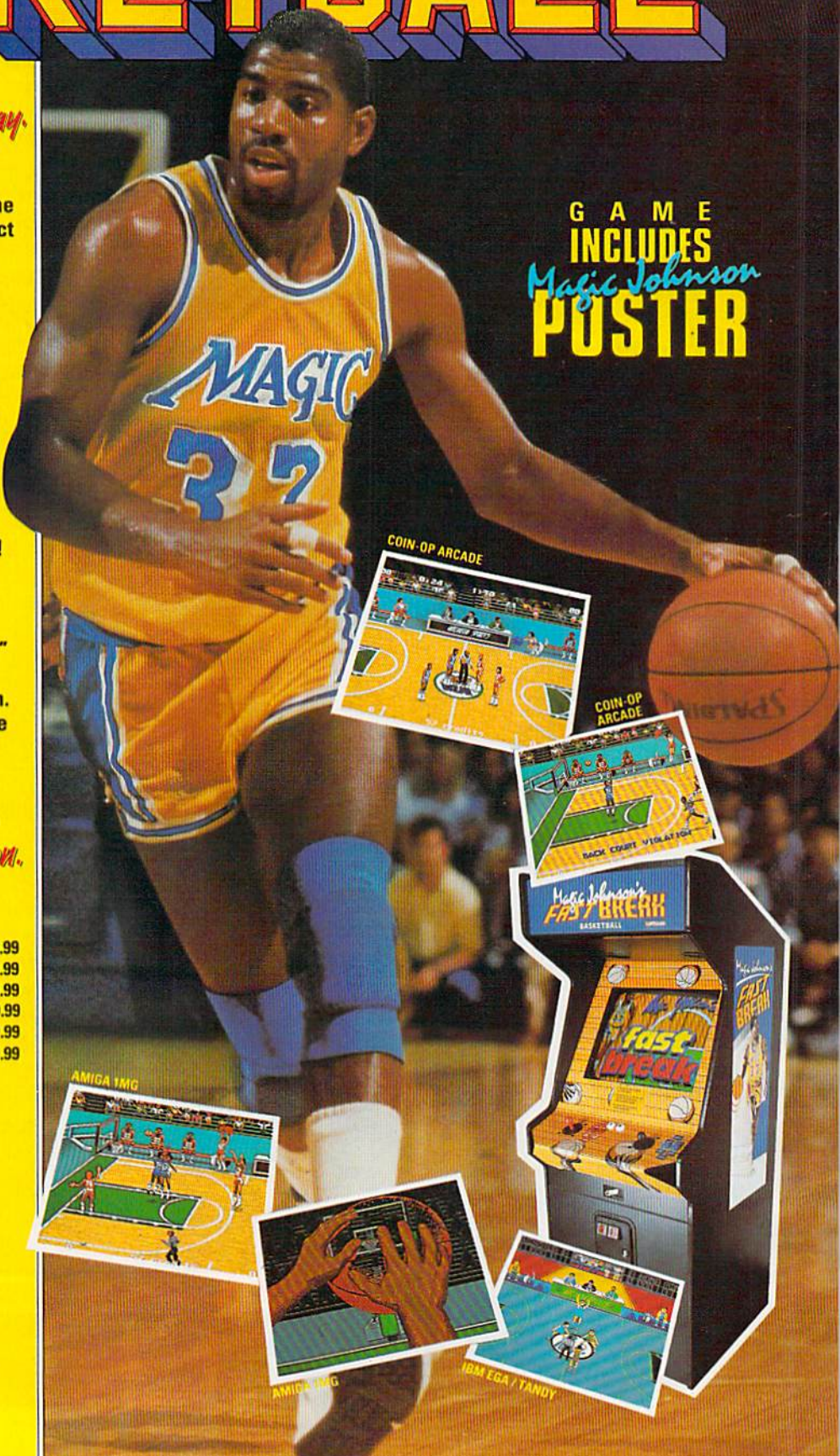

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